VOLUME XXXIX Established 1914 Number 6

CHEMICAL INDUSTRIES

DECEMBER, 1936

CHEMICAL INDUSTRIES is published monthly by The Haynes & George Co. WILLIAMS HAYNES, *President*; W. F. GEORGE, *Vice-President*; D. O. HAYNES, *Secretary*; J. H. BURT, *Treasurer*.

Published on the tenth day of each month at New Haven, Conn., and printed for the publishers by The Tuttle, Morehouse & Taylor Company.

Entered as second class matter, December 22, 1934, at the Post Office at New Haven, Conn., under the act of March 3, 1879.

SUBSCRIPTION RATES: Domestic and Canadian, one year $3.00 in advance; two years, $5.00; three years, $6.00; foreign, $1.00 a year additional; single copies of the current issue are twenty-five cents each, back issues fifty cents each. Notice of three weeks is necessary in order to change subscriber's address, and in notifying, kindly give both the old and new addresses.

Table of Contents

CHEMICAL INDUSTRIES *is indexed regularly in the* INDUSTRIAL ARTS INDEX

PUBLICATION AND EDITORIAL OFFICES, NEW HAVEN, CONN. ADVERTISING SALES OFFICE, 25 SPRUCE ST., NEW YORK, N. Y.

VOLUME XXXIX Established 1914 Number 6

CHEMICAL INDUSTRIES

DECEMBER, 1936

CHEMICAL INDUSTRIES is published monthly by The Haynes & George Co. WILLIAMS HAYNES, *President*; W. F. GEORGE, *Vice-President*; D. O. HAYNES, *Secretary*; J. H. BURT, *Treasurer*.

Published on the tenth day of each month at New Haven, Conn., and printed for the publishers by The Tuttle, Morehouse & Taylor Company.

Entered as second class matter, December 22, 1934, at the Post Office at New Haven, Conn., under the act of March 3, 1879.

SUBSCRIPTION RATES: Domestic and Canadian, one year $3.00 in advance; two years, $5.00; three years, $6.00; foreign, $1.00 a year additional; single copies of the current issue are twenty-five cents each, back issues fifty cents each. Notice of three weeks is necessary in order to change subscriber's address, and in notifying, kindly give both the old and new addresses.

Table of Contents

CHEMICAL INDUSTRIES *is indexed regularly in the* INDUSTRIAL ARTS INDEX

PUBLICATION AND EDITORIAL OFFICES, NEW HAVEN, CONN. ADVERTISING SALES OFFICE, 25 SPRUCE ST., NEW YORK, N. Y.

The Reader Writes:—

Both Were Written Before November 3

You were a pretty smart prognosticator when you opined in your September issue that the election would smash our faith in the accuracy of pre-election polls. I voted agin m'lord Franklin too; but I must tell you that your editorial on the politicians tasted like very sour grapes to me. You are so intelligent in analysis and so courageous in presentation that I am grieved you were not tolerant enough to accept the verdict of the polls without casting aspersions on the intelligence of the voters.

Pittsburgh, Pa. W. P. FISKE.

You're Asking Us?

Why not add a "letter box" department, similar to the "Fragekasten" in the *Chemiker Zeitung,* but less technical?

New York City. H. MULLER TOURAINE.

So What?

Feel your editorial comments, particularly on politics and related subjects, are superfluous, shallow, short-sighted, and obnoxious.

Newark, Del. F. H. MCBERTY.

Your editorials are good, fearless, stimulating stuff. Keep it up!

New York City. KENNETH B. MILLETT.

A Prophet Without Honor

You were certainly right in forecasting that the election returns would upset the straw vote polls. Otherwise your political prophecies seem to be 100 per cent. wrong. This ought to be a lesson to you.

Memphis, Tenn. CHARLES P. HOPKINS.

Rally Call for Chemical Philatelists

I'm not distinguished enough to rate "The Chemical Who's Who," but I am a chemist and a stamp collector. The amusing hobby statistics in your "We"—Editorially Speaking Department point out that there are many others who combine these vocations and avocations. Why not a Chemical Stamp Club?

Philadelphia, Pa. LOUIS E. ANDRESON.

Supplies of Phenol

Referring to anonymous article in CHEMICAL INDUSTRIES for November, entitled "Independence in Phenol": Generally speaking, the production of phenol from waste liquors from coke oven plants will be practiced only when required to prevent stream pollution. The location of the majority of coke oven plants is such that this will not be a required cause.

Referring to the statement that the phenolic content of tar from low temperature coal carbonization is much higher than in coal tar derived from by-product coke, this is only true when the term phenolic is considered as descriptive of all bodies in coal tar distillate that can be removed by treatment with caustic soda. The actual phenol content and the actual specification cresols in the low temperature tar are very small—most of the so-called phenolic bodies are higher boiling complex bodies that cannot be used in the manufacture of pure phenol and pure cresols. They do have a use in the manufacture of high coefficient disinfectants.

The truth on this subject is very generally misunderstood.

Without venturing any definite prediction about the future development of low temperature carbonization in the United States, I may repeat what has been previously said by other well informed persons who are conversant with coal tar products, that low temperature carbonization in order to be economically valuable must produce a fuel which can compete with other fuels and not depend on any more than nominal value for the by-products.

New York City. S. R. CHURCH.

Progress by Injunction

More than a dozen bills were introduced in the last session of Congress on the general subject of stream pollution, and this legislation is sure to be brought up at the coming session. Some of the proposed bills would extend the control of the Federal government, which now goes to the head of navigation, way up to the smallest spring that feeds any river, which would amount to practical control of all the streams in the land. Whether or not this is wise or necessary is not the point I should like to raise at this time. The fact that many of these proposed bills are extremely radical in their proposals and that this type of legislation is of vital concern to the chemical process industries seems to have escaped general attention. It is a subject you should devote space to for it is impossible to clean all effluents to the C. P. Standards that some seem to consider necessary; and if such ideas were embodied in the law of the land, they would completely upset a vast number of chemical process plants.

Boston, Mass. LAWRENCE PAGET.

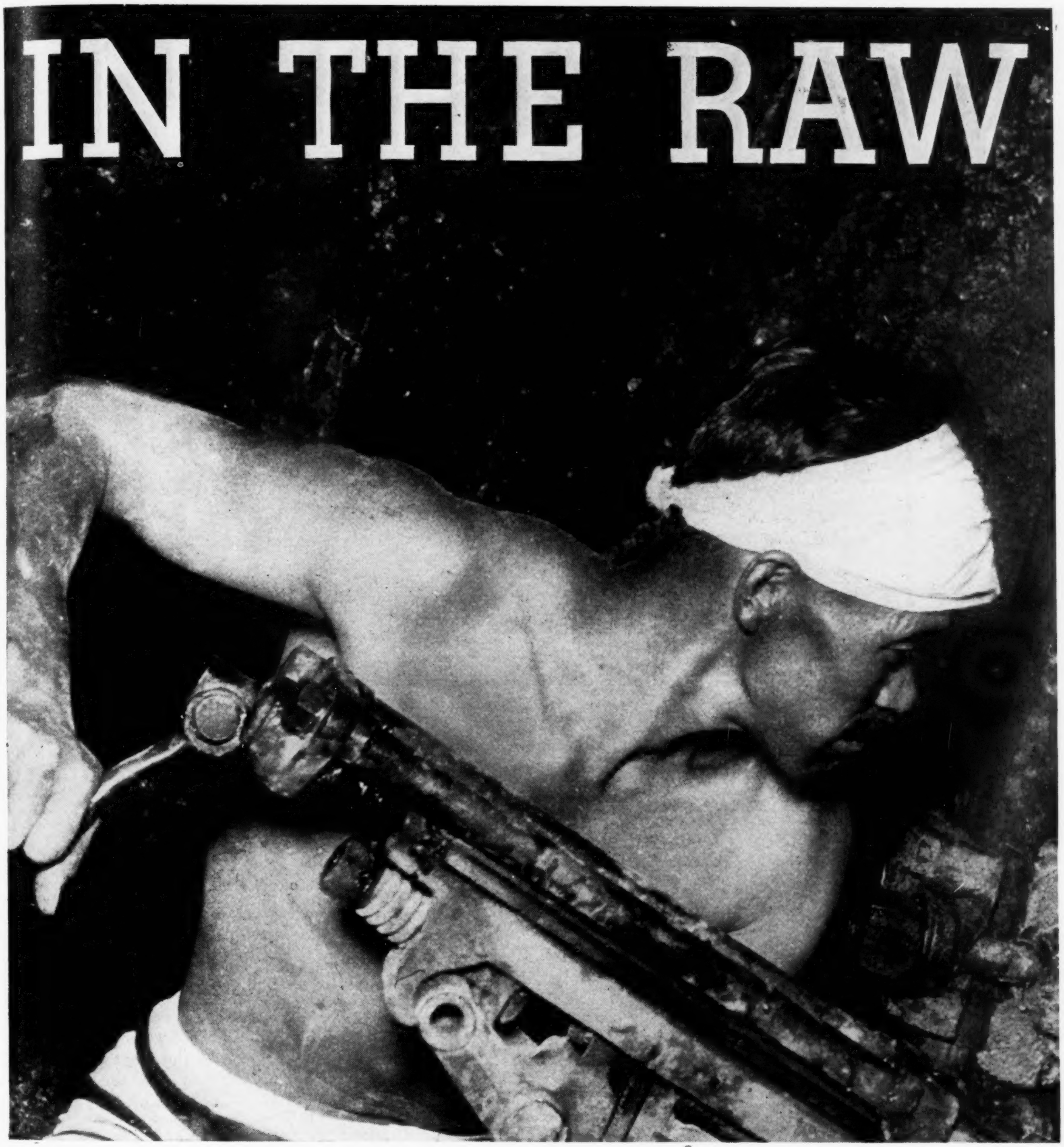
Advertisers, Please Note

At the edge of the festive season when the new automobiles, the Scotch whiskies, and the perfumes in trick bottles are vieing with each other on every printed page, I want to compliment you upon the unusually attractive and informative advertisements printed in your current issue. It is part of my job to read chemical advertisements for the higher-ups in our organization, and more pages are noted for their attention from this number than in any other technical or trade paper in many months.

Nobody asked my advice, but it might be helpful for you to be able to tip off your advertisers that it is what they say that counts, not how they say it or how they dress it up with "art work". Outstanding in this kind of reader interest are the blue inserts of the U. S. Industrial Alcohol Company and the announcements of Hercules Powder and the Carbide & Carbon Chemicals Corp. Not always, but often, the advertisements of Dow, Witco, Jacques Wolf, du Pont's R & H, and Sharples have real valuable data in them. I like a good looking piece of advertising, but a list of chemicals for all the world like the list of flavors hanging over a soda fountain, no matter how pretty the "lay-out," leaves me cold.

The chap who said that the trouble with chemical advertising was its lack of sex appeal was dead wrong. Too much chemical advertising lacks chemical appeal.

New York City. T. T. BARRETT.



ON a palm-fringed island in the South Seas, Mutual mines its Chrome Ore, bringing to industry an efficient co-ordination of every detail from mining the raw material to the production of the finished product in two modern plants on the eastern seaboard. During ninety years of development and experience, Mutual has earned a unique position as the world's largest and most basic manufacturer of chromium chemicals.

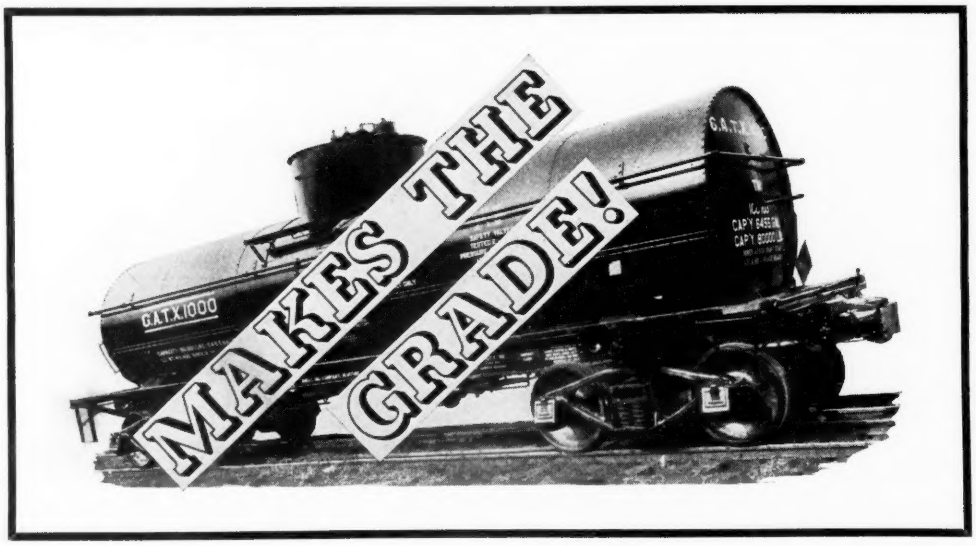
Plants at Baltimore and Jersey City — Mines in New Caledonia

BICHROMATE OF POTASH — BICHROMATE OF SODA — CHROMIC ACID — OXALIC ACID

MUTUAL CHEMICAL COMPANY

Mutual Chemical Company of America - - - 270 Madison Avenue - - - New York City

SOUTHERN ALKALI

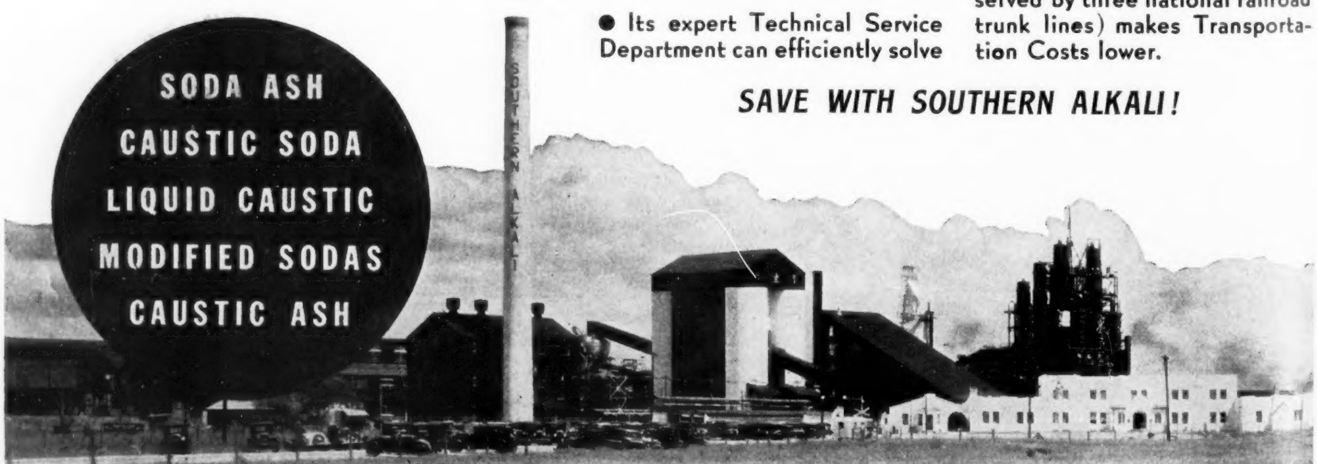


...DEMANDED BY THE EXACTING REQUIREMENTS OF THE PROCESS INDUSTRIES

BECAUSE:

- It knows the requirements of the Process Industries.
- Its own sources of raw materials are close at hand.
- Its ideal location insures quicker deliveries.
- Its expert Technical Service Department can efficiently solve production and handling problems.
- The high quality of its products is second to none.
- AND . . . its coastal location on tidewater (where it is also served by three national railroad trunk lines) makes Transportation Costs lower.

SAVE WITH SOUTHERN ALKALI!



SOUTHERN ALKALI CORPORATION • 30 ROCKEFELLER PLAZA • NEW YORK, N. Y.
SANTA FE TERMINAL BUILDING • DALLAS, TEXAS
CORPUS CHRISTI, TEXAS

A N N O U N C E M E N T

IT IS with pleasure that we announce our new address. Here, under one roof, equipped with every modern facility for efficient service, are combined the GDC offices, laboratories, warehouse and shipping rooms. From these new quarters GDC now offers its customers the advantages of a complete line of dyestuffs for wool, cotton, silk, rayon, paper, leather, paints, dry colors, resins and various other trades using colors or allied products, backed by a comprehensive technical service for their application. GENERAL DYESTUFF CORPORATION, 435 Hudson St., N. Y.

PHOTOGRAPH OF CRYSTALS (ACTUAL SIZE). NOTE UNIFORMITY

THE exceptional crystal-size uniformity for each of the grades is a characteristic of the General Chemical Company product. The chemical purity is an industry standard. To these reasons for preference add the Company's facilities for meeting delivery requirements and this becomes, inevitably, a prime source of supply.

T. S. P. — IN COARSE, MEDIUM, GRANULAR AND FINE CRYSTALS

Also: Sodium Metasilicate and a long list of Heavy Chemicals of Standard Purity.

GENERAL CHEMICAL COMPANY

REG. U. S. PAT. OFF.

GENERAL CHEMICAL COMPANY

40 RECTOR STREET, NEW YORK

(Cable Address—Lycurgus, N. Y.)

Sales Offices: ATLANTA, BALTIMORE, BOSTON, BUFFALO, CHARLOTTE, CHICAGO, CLEVELAND, DENVER, KANSAS CITY, LOS ANGELES, MINNEAPOLIS PHILADELPHIA, PITTSBURGH, PROVIDENCE, SAN FRANCISCO, ST. LOUIS. In Canada: THE NICHOLS CHEMICAL CO., LTD., MONTREAL, TORONTO

How to Choose Bichromates

Regardless of how you now make your choice, these three simple rules will assure you the finest bichromates:

Be sure the company behind the products has been in business twenty-seven years.

Pick the source of supply that has always been dependable during that time.

Accept no substitute for standards established by that company. Words such as "or equal" will not bring you Natural Bichromates.

Maybe your preference will be based on the product itself, perhaps on some special feature. But it's the company you are doing business with that usually builds confidence in its brand. Try Natural Bichromates and see.

Bichromate of Soda (Crystals)

Bichromate of Soda (Granular)

Bichromate of Potash (Crystals)

Bichromate of Potash (Granular)

Bichromate of Potash (Precipitated)

Sulphate of Soda

NATURAL PRODUCTS REFINING COMPANY
904 Garfield Ave., Jersey City, N. J.

Natural

BICHROMATES

CHEMICAL INDUSTRIES

VOLUME XXXIX NUMBER 6

Patent Practice

THE centenary of the establishment of the Patent Office will be marked more significantly than by the pleasant, appropriate festivities in Washington, .or evidently the long-pending, and much discussed law to modernize our patent court practice will pass the coming Congress. It is legislation in which chemical people have deep interest.

The McAdoo bill, considered the most apt to pass, is far more than a revision to simplify the present procedure. In the fashion of the moment it goes off on an entirely new and untried track. So revolutionary are some of its changes that while all agree that there is need for revision, few among those who have studied this bill agree to all its provisions. The endorsement of the bill by the Chemical Engineers was tempered by the qualifying phrase "in principle," which is a plain criticism of some of its details.

To pick out but one feature—the use by the Court of its own technical experts as advisers is approved heartily in principle. Many feel, however, that these court experts should publish their opinions. More believe they should be subject to cross examination. Very few think that three men can be found in the land competent to pass upon the technicalities of every patentable thing from mouse-traps and dolls to enzymes and optical lenses. And this is only one of many radical innovations in the McAdoo bill.

Present procedure is too time consuming and too costly. The record shows that patent property rights have been successively weakened by a long series of court decisions. Technicalities of the law have assumed undue importance. These evils should be corrected, but we should be sure that in correcting them we do not create new difficulties.

Selfish, Sloppy Legislation

Formerly a law was drafted with great care so that its intent was clear, any violation unmistakable, and the punishment plain. In the Patman Law the last Congress climaxed the growing tendency to slap together legislation whose purpose is either wishful or spiteful, whose administration is turned over to the bureaucracy, and whose interpretation is passed along to the federal judges.

The law-making habit is a famous vice of democracies, one which has oft-times contributed seriously to their downfall; and the worst form of this evil is class legislation granting regulatory powers to government officials whose duties are not precisely defined.

Conspicuously the Patman Law falls within the margin of this highly undesirable class—not so much for its intent, but because of the sloppy way in which it was written and the selfish motives that led to its passage. Senator Patman himself admits as much when he promises revision. Let us hope that with an overwhelming party majority, which should remove any temptation to play politics, that this revision will simplify the purpose of this law and make its provisions crystal clear.

New Chemical Raw Materials

Germany's efforts towards complete chemical independence are well known, but what measure of success has been won is obscured by incomplete or tardy statistics, governmental control alike of credits and shipments both to and from foreign countries, and a perfectly understandable secrecy that veils some of the most interesting operations. Therefore, we cannot but be particularly interested in the facts about her motor fuel developments which were brought to light at the recent British Institute of Fuel meeting.

It appears that this coming year half of the German requirements for automobiles and aviation will be produced synthetically; viz., seven million metric tons of motor fuel. Translated into American terms this represents about one-seventh of our domestic consumption, or somewhat in excess of two billion gallons. The size of this figure will surprise many who are well informed on chemical progress.

Most suggestive is the rapid commercial development of motor fuel synthesis from carbon monoxide to CH_2 and via the so-called "Kogasin synthesis" to hydrocarbons ranging from gasoline to waxes with melting points as high as 125°. Dr. Franz Fischer, who since 1921 has been the leader in this line of German research, pointed out not only the technical advantages of starting with a pure gas rather than through the direct hydrogenation of raw coal but also the industrial advantages of working under low pressures and in apparatus made of ordinary, easily fabricated, inexpensive materials of construction. The Fischer process apparently opens up such a range of products as the high test motor fuel, the new lubricant, the drying oil, and gummy material produced by the polymerization of isobutane which Dr. Egloff displayed at the Petroleum Institute last month. Thus both from natural and synthetic sources we may expect new materials of the straight-chain hydrocarbon family.

This is a novel aspect of the historic competition between land and laboratory, carrying the synthetic vs. natural problems back to the first steps in chemical manufacture.

Science Takes a Verbal Thrashing

Says Dr. Iago Goldston: "I prognosticate, holding to my mind's eye that gazing globe, past history, that unless Science amends its faults it will, like blind Samson, bring down the palace upon itself."

Stirring words; but we are not impressed, though we are curious to learn what Dr. Iago Goldston finds to be the faults of Science.

So we read on—"Scientists are suffering a sort of delirium tremens due to the inhibition of too much of that narcotizing something called inductive Science."

Grand "ten dollar words" these, but still we are not impressed, for that sonorous sentence, if you stop to think about it, means just plain "pooh". Nevertheless we read on to discover what, if anything, Dr. Iago Goldston proposes to do about it.

He does—he pleads eloquently for the "methods of the politician and the superstitions of the common man," claiming that in solving human problems "these illogical and intuitive reactions are more to the point than mathematical logic."

Dr. Iago Goldston, in case you are interested, is a rather important member of that efficient medical bureaucracy headed by Dr. Morris Fishbein which rebukes chemists for daring to discuss the therapeutic action of new chemicals without permission of the American Medical Association. Dr. Goldston is, of all things, Executive Secretary of the Medical Information Bureau of the New York Academy of Medicine!

Chemical Repercussions to Petroleum Cracking

By Gustav Egloff

Educated at Columbia, with a life-long practical experience in the chemistry of hydrocarbons, gained with the U. S. Bureau of Mines, as director of the Aetna Chemical Company, and for the past twenty years director of research of Universal Oil Products, Dr. Egloff speaks with real authority.

A potent factor in the tardy chemicalization of the oil industry, the cracking process has not only opened a new market for $10,000,000 worth of chemicals, but is also furnishing new raw materials. Its economic effects are here abstracted from a masterly paper read at the Petroleum Institute.

CRACKED gasoline brought with it new refining problems because of its ready oxidation and gumming properties in the raw state. By using anti-oxidants to inhibit gum formation, it has been possible to reduce—and in some cases entirely to eliminate—treatment, with the exception of sweetening. This has brought about savings of as much as 17 cents per barrel of gasoline in some plants. The use of anti-oxidants is rapidly increasing, and less and less cracked gasoline is chemically refined.

It is estimated that 85 per cent. of the gasoline now marketed in the United States is dyed—simplifying the refining process by doing away with the treating to water-white color. A number of light stabilizing inhibitors have been developed, which have also cut down the cost of refining of cracked gasoline.

The chemical industry has benefited—by the utilization of anti-oxidants, dyes, and color stabilizers in gasoline—to the extent of more than $10,000,000 worth of business a year. New compounds have been developed for this purpose, some dyes having the double function of a dyeing agent and anti-oxidant.

At the present time heavy chemical treatment is used primarily for gasolines whose sulfur must be reduced. The development of cracking has caused the utilization of many low-grade high-sulfur crude oils. Some of these produce cracked gasolines having considerably more than 0.1 per cent. sulfur, which at one time was considered the safe limit. The gasoline sold at present in California, Oregon, Washington, Idaho, Nevada, and part of Texas has a sulfur content of 0.25 per cent.; and in some localities it rises to more than 0.4 per cent. The cost of gasoline would be increased at least $10,000,000 a year to reduce the sulfur content of the gasoline marketed in these areas from the harmless 0.25 per cent. to the needlessly severe specification of not more than 0.1 per cent.

A number of new chemical industries have been founded upon the olefins produced by the cracking process, while the oil industry itself is deriving more and more of its products by chemical synthesis. Alcohols, such as ethyl, *iso*propyl, butyl, amyl, and higher, are being produced commercially from the olefins present in cracked products. Ethyl alcohol is being produced at the rate of more than 4,000,000 gal. a year, which has its economic effects upon other sources such as molasses, grain, potatoes, etc. Ethylene glycol, used primarily as an anti-freeze fluid, is highly competitive with other agents used for this purpose, such as wood alcohol, ethyl alcohol, and glycerine.

Great progress has been made in the production of ethers from cracked gas, the latest of which are *iso*propyl and other branched ethers, which have high octane ratings as motor fuels. This latter development was reported upon by the Standard Oil Development Company before the Society of Automotive Engineers last June. It was stated: "A recent survey of potential supplies of propylene, the raw material for making *iso*propyl ether, has shown that in this country sufficient is available, exclusive of all other normal demands for other purposes, to produce at the present time approximately 340,000,000 gal. per year of technical *iso*propyl ether. Assuming that 100 octane fuel is required (using 3 cc. lead per gal.) this is sufficient to produce some 850,000,000 gal. per year of finished product."

Resins from the olefins of cracked products are developing into a major industry—finding use as protective coatings, plastics, and rubber-like material highly resistant to oils, oxidation, alkalies, and acids. These various resins are polymers derived from cracked products—produced by a number of methods—one of which is aluminum chloride, acting on olefins and diolefins present in cracked oils and gases.

The resin produced by the action of aluminum chloride on a narrow fraction of highly-cracked gasoline is soluble in light distillates and benzene. The extensive application of this material in combination with glyceride oils, such as linseed and other drying oils, has given a group of new materials to the paint and lacquer industries. The resins are mixed with the desired drying oil or combination of oils, and heated to give the proper consistency to the varnish body. Cheap thinners, such as gasoline and naphtha, are suitable diluents for the varnish. An under-coating or priming coat of this material will dry enough in an hour for the finishing coat to be applied. To enhance the drying qualities which are commensurate with high-priced lacquers,

benzene, toluene, or xylene, are added—along with metallic driers, such as the resinates and linoleates of cobalt and manganese—to decrease the drying time.

In the refining of vapor-phase cracked gasoline with Fuller's earth, the lower-molecular-weight olefins and diolefins are polymerized into synthetic petroleum resins. These resins may be made up of light non-viscous liquids or solids. These products have found industrial application as resins in paints, varnishes, printing inks, as substitutes for linseed, China-wood, and perilla oils; and, due to their plastic properties, are used as binders.

Straight-chain hydrocarbons of high molecular weight, ranging from viscous oils to solid crepe-rubber-like material, are produced by the polymerization of *iso*butene from cracked gases. These polymers, marketed under the name of "Vistanex," are highly resistant to acids, alkalies, weathering, and aging. They may be used as coatings for tanks, textiles, paper, rubber articles, leather; as plasticizers for Duprene, Thiokol, chlorinated and sulfated rubbers, paraffins, halogenated compounds; and as resins, pitches, asphalts, adhesive and waterproofing agents, thickeners for medicines, oils, and components for chewing gum and soft-core centers of golf balls. It is also used for compounding with rubber to increase its stability toward oxidation and aging. Synthetic rubber is made in Russia by the polymerization of butadiene from cracked gases in the presence of sodium.

Ethylene from cracked gases is one of the base materials used in the production of Thiokol. Ethylene is chlorinated to ethylene dichloride, and treated with a sodium-sulfide complex. These high-polymer condensation products are competitive with natural rubber and synthetic rubbers for use as hose, ceiling or floating roofs, molded articles, cable insulation, etc.

The commercial production of high-molecular-weight polymers from cracked products is relatively small in comparison to the whole resin industry, but it is certain that the economics of the rubber and resin industries will be affected markedly by these new products.

A plant for the manufacture of acetylene from cracked gases by means of electric-arc temperatures is reported to be in commercial operation. The acetylene is converted into acetic acid, which becomes highly competitive with the wood-distillation industry and the acetylene-making industry itself.

Several huge chemical plants are in commercial operation based upon the olefins present in cracked products to produce alcohols, amines, chlorides, glycols, nitroglycols, chlorohydrins, ethers, ketones, acids, and esters. A \$10,000,000 synthetic-chemical plant based upon cracked products is in commercial operation at Whiting, Ind., and another is projected elsewhere which it is reported will cost \$20,000,000.

Cracked acid sludges are finding uses as inhibitors, which greatly lower the amounts of metal lost in pickling operations. These inhibitors are being marketed in competition with relatively expensive synthetic organic products. In one refinery alone it is estimated that there are available about 30,000 lb. per month of pickling inhibitors.

A sulfuric-acid plant is in commercial operation based upon the hydrogen sulfide present in the gases produced from cracking in the El Segundo plant of the Standard Oil Company of California. This plant operates on the phenolate process to produce relatively pure hydrogen sulfide which, in turn, is oxidized to sulfuric acid. "The cost of sulfur delivered to the acid plant in this form is materially less than the cost of brimstone." The unit is designed to produce an average of 85 tons of sulfuric acid a day. The unit is operating on 13,000,000, cu. ft. of cracked gas a day, which contains 4.5 per cent. hydrogen sulfide. The total quantity of hydrogen sulfide present in cracked gases produced yearly can be converted into sulfuric acid in tonnage greater than the entire consumption of 980,000 tons used in the oil industry during 1935.

Vast as has been the achievement of cracking and utilization of its products, one may well say that, with the army of research workers now in the oil industry, new discoveries will follow—with many products yet to come. It may well develop that the researcher will first design the hydrocarbon or hydrocarbons that he desires for the use to which they are to be put, and then find ways of producing them. For example, *iso*octane but a few years ago was a chemical curiosity, and was synthetized at a cost of \$20 a gallon. Now the industry produces it in commercial quantities for airplane use.

There is no one more alert than the oil industry in striving for full conservation of oil resources and products derived therefrom. It is the oil industry itself that is forcing the conservation ideal by spending huge sums yearly in research to utilize its resources and products to the maximum utility for our social and economic benefit.

Industry's Bookshelf

Chromium Plating by Prof. O. Bauer, Prof. H. Arndt, and Dr. W. Krause, 266 pp., Longmans-Green & Co., 114 5th ave., N. Y. City, \$9.50.

The English translation of this reference work contains additional material to bring it up-to-date. A particularly valuable reference work for those electroplating for the automotive field.

Catalytic Reactions at High Pressures and Temperatures by Vladimir N. Ipatieff, 786 pp., The Macmillan Co., N. Y. City, \$7.50.

Book is primarily a collection and review of the distinguished author's research in the field of catalysis during the past 35 years. He defends certain of his work that has been criticized.

Canadian Trade Index (12th Ed.), 842 pp., Canadian Manufacturers' Association, \$6.

The Guide Book of Canadian industry. This latest edition contains a section devoted to export statistics, an alphabetical list of manufacturers, representatives, etc., a directory of manufacturers and their products, a shipping directory, and a list in French and Spanish of manufacturers.

Fluorspar as a Chemical Raw Material

By Frank H. Reed and G. C. Finger

Chief and Assistant Chemists, Illinois State Geological Survey

THE mineral fluorite, commonly known as fluorspar, CaF_2, contains 48.7 per cent. fluorine and 51.3 per cent. calcium by weight. It crystallizes in the isometric system and is often found as cubic crystals. It ranges from transparent to a translucent white and occurs in various shades including blue, green, yellow, pink, lavender, and brown. Fluorspar generally occurs in (1) roughly vertical veins in beds of limestone or sandstone, and (2) in blanket deposits interspersed with clay. The veins are worked by shaft mining reaching in some cases a depth of 600 feet, and the blanket deposits by open cut or drift mining. Common impurities are galena, sphalerite, calcite, silica, barite, etc.

Fluorspar was first mined commercially in the United States in 1837 near Trumbull, Conn.,[44] but Illinois and Kentucky deposits, along the Ohio River, now account for over 90 per cent. of our production.

The earliest use for fluorspar was as a flux in smelting operations and today approximately 75 to 85 per cent. is used for that purpose. Chemical and ceramic industries consume practically all of the balance.

Production of fluorspar is one of the smaller nonmetallic industries with a capital investment of ten million dollars. Shipment from mines in 1935[56] totalled 123,561 short tons valued at $1,858,334, an average price of $15.04 per ton.

Uses of Fluorspar

The steel industry is the largest user; the chemical industry is second; and the glass industry is third, followed by a large number of miscellaneous uses. In this paper, enamel and vitrolite are classified with glass as ceramic industries. The consumption of fluorspar by industries for 1926 to 1935 inclusive is given in Table I and Figure 1 illustrates it graphically.

The principal commercial grades of fluorspar[11] are given in the opposite column.

Table II—Principal Commercial Grades of Fluorspar

Name	Principal Uses	Form	CaF_2 Not less than	SiO_2 Not more than	Fe_2O_3 Not more than
Metallurgical	Basic open hearth steel	Usually gravel sometimes lump	85	5	...
Ceramic	Glass and enamel	Ground	95	3	0.1
Acid	Hydrofluoric acid and derivatives	Ground	98	1	...

Specifications in Per Cent.

In metallurgical processes outside of giving fluidity to the slag, fluorspar is not thoroughly understood. Schwerin[66] made an excellent review of this problem. It is generally conceded that the fluorspar is of great assistance in the removal of impurities such as sulfur and phosphorus. The quantity varies from one to fifty pounds per ton of steel with the average being five to eight pounds.[55] During periods of economic depression the tendency is to decrease this amount. A small amount is used in the manufacture of alloy steel and ferro-alloys by electric furnaces, and in other metallurgical processes.[50]

Consumers of metallurgical spar can use material having less than 85 per cent. calcium fluoride and may buy spar of lower purity penalizing the producer according to prearranged agreement.

Chemical Industry

Consumption of fluorspar as a raw material for hydrofluoric acid and its derivatives is the second largest use. In the chemical industry it is used solely for its fluorine content. Fluorine is the most electronegative element, as well as one of the most reactive. For years its tremendous reactivity resisted the efforts of the most capable investigators to isolate this element. Although Henri Moissan in 1886 finally succeeded in preparing gaseous fluorine by electrolysis of potassium acid fluoride, the reactivity of the element and the resulting difficulties prevent the commercial use of fluorine as such.

Table I—Annual Fluorspar Consumption in the United States in Per Cent. by Industries (1926-1935)*

Industry	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	Average
Basic open-hearth steel	81.3	78.3	77.5	79.9	78.9	70.4	64.8	72.5	73.2	72.2	74.9
Electric furnace steel	2.7	2.7	3.1	3.3	2.6	3.3	3.7	4.0	3.9	3.9	3.3
Foundry	2.5	1.9	1.7	1.4	1.2	1.1	1.1	1.1	1.4	1.4	1.5
Ferro-alloys	0.3	0.3	0.4	0.5	0.8	0.3	0.4	0.3	0.4	0.5	0.4
Hydrofluoric acid and derivatives	4.4	8.8	10.4	8.0	9.1	12.8	12.5	9.2	10.0	9.3	9.5
Enamel and vitrolite	3.8	3.3	2.9	2.7	2.9	3.2	4.3	3.8	3.2	3.6	3.4
Glass	4.6	3.9	3.2	3.4	3.1	7.5	12.0	8.3	7.0	8.4	6.1
Miscellaneous	0.4	0.8	0.8	0.8	1.4	1.4	1.2	0.8	0.9	0.7	0.9

* Data based on Minerals Yearbooks, U. S. Bureau of Mines.

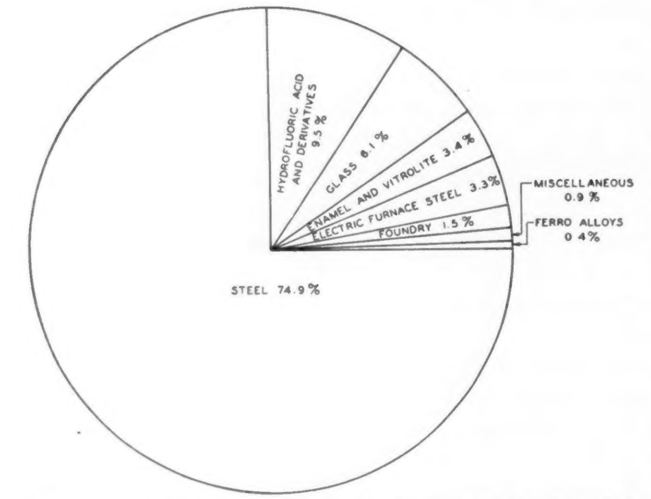


Figure 1. Fluorspar consumption in U. S. by industries, 1926-1935. Data based on Minerals Yearbooks, U. S. Bureau of Mines.

Hydrofluoric acid is made from acid spar by interaction with sulfuric acid in suitable iron kilns. $CaF_2 + H_2SO_4 \longrightarrow CaSO_4 + 2HF$. Two types of acid are now commercially available, aqueous and anhydrous grades. Aqueous acid is made by absorption of the hydrogen fluoride in water in suitable lead cooling and absorbing towers.[8, 24] Anhydrous acid is made under more rigidly controlled conditions, as finely ground acid spar is treated in a rotating cylinder at a temperature above the boiling point of hydrofluoric acid and below the melting point of calcium fluoride and calcium sulfate, with a sulfuric acid spray over the surface of the batch, the acid being added so slowly that there is substantially no caking of the mass.[9, 10]

For the manufacture of hydrofluoric acid the so-called acid grade of spar is used. Silica is particularly undesirable as it reacts with hydrofluoric acid to form silicon tetrafluoride which in turn dissolves in the acid to form hydrofluosilicic acid. If anhydrous acid is being produced the water of reaction is undesirable. For certain reactions it is doubtful if the hydrofluosilicic acid is harmful beyond reducing the concentration, acting as an inert diluent. In such cases it might well be to the economic advantage of both producer and consumer to use acid spar, for the production of hydrofluoric acid, which contains a slightly lower percentage of CaF_2 and a slightly higher silica content.

Anhydrous acid of over 99 per cent. purity has been quoted in tank cars at 20c per pound. Since 95 per cent. of the acid is composed of the element fluorine it is, therefore, the cheapest source of fluorine in a usable form for the chemical industry. As previously indicated, the usual impurity is H_2SiF_6 resulting from the silica present in the spar.

The aqueous acid of commerce usually runs from 40 to 60 per cent. HF and is shipped in lead carboys or more recently in special rubber barrels.[16] Bakelite, Haveg 43, wax, hard rubber, and amber are also common container materials. The anhydrous acid is shipped in iron; magnesium, copper, and brass can also be used.

Ceramic uses demand a special grade of fluorspar, the chief requirement from the standpoint of chemical constitution besides a high calcium fluoride content being freedom from iron or other coloring materials. It is used in glass manufacture where opal or opaque, colored, and also clear glass is desired. The enamel and vitrolite manufacturers use it primarily as a fluxing and opacifying agent. Opacity is probably due to the separation of fluorides as solid crystallites.[1, 68]

Miscellaneous Uses

A considerable number of minor uses involve various properties of fluorspar itself. The cement industry has investigated the use of calcium fluoride in the clinkering process for the manufacture of Portland cement.[6, 47] Some fluorspar is used in the manufacture of calcium carbide and cyanamide[49] to facilitate the fusion and contact of ingredients. It is used as a paint pigment,[60] a binder in abrasives, in the manufacture of high temperature resistant brick, carbon electrodes, as a catalyst,[49] in the production of aluminum from bauxite,[49] in a process for the extraction of potash from feldspar,[50] and its use has been proposed in the manufacture of building material from ashes, etc. Various optical instruments use the clear material because (1) it has a low index of refraction, (2) it has a high transmissibility to light, especially to the ultra-violet, and (3) it displays no double refraction.[62] Some of the colored material may find its way into jewelry and stone ornaments.

The largest use for hydrofluoric acid is the preparation of inorganic fluorides. It is also used to clean, polish, and etch glass, in the textile and bleaching industries, for pickling and galvanizing metals, chromium plating, the production of Betts electrolytic lead, the removal of efflorescence from stone and brick, in chemical analysis, the extraction of tantalum and columbium, the hydrolysis of cellulosic materials,[37] the synthesis of organic fluorine compounds, as an antiseptic, fungicide, bactericide, and antifermentative, in the preparation of filter and special papers, and for the removal of silica and iron oxide from graphite.

The anhydrous acid can be used directly in the synthesis of organic fluorine compounds[32, 39, 42, 46] and offers promise of replacing antimony trifluoride as a commercial fluorinating agent. It is an excellent reac-

Table III—Comparison of the Properties of Hydrogen Fluoride with Those of Related Compounds*

	Freezing point °C.	Boiling point °C.	Molar heat of fusion calories	Molar heat of vaporization calories	Dielectric constant
HF	— 83	19.5	1.09×10^3	6.2×10^3	83.5 (0°)
HCl	—114	—85.8	0.50×10^3	3.6×10^3	4.60 (27.7°)
HBr	— 86	—67.1	0.62×10^3	4.0×10^3	3.82 (21.7°)
HI	— 53.6	—36.0	0.72×10^3	4.4×10^3	2.9 (21.7°)
H_2O	0	100	1.34×10^3	9.2×10^3	88 (0°)†
H_2S	— 85.5	—61.8		4.4×10^3	5.75 (10°)
HCN	— 13.8	26.5		5.7×10^3	95 (21°)
NH_3	— 77	—38.5	1.84×10^3	5.6×10^3	14.9 (24.5°)

* Simons, Chem. Rev. *8*, 218 (1931).
† Calculated from I. C. T. *8*, 78.

tion medium for the quantitative nitration of benzene to nitrobenzene according to a German patent.[25] Fluorosulfonic acid is made by the reaction of sulfur trioxide with HF.[2]

The properties of anhydrous hydrofluoric acid have been excellently reviewed by Simons.[67] Table III shows that it has an anomalous boiling point which is probably due to its high degree of association as H_6F_6, its dielectric constant is very high, and its molar heats of fusion and evaporation are also fairly high.

Klatt et al.[26, 43] have also made extensive studies on the properties of organic compounds in liquid HF.

Inorganic fluorides are prepared with the aqueous acid from the carbonates, oxides or hydroxides. The acid fluorides can be readily obtained by using an excess of the acid. Very few of the double salts are used and their method of preparation depends upon the proper proportions of each of the constituents. The uses of the inorganic fluorides are very diversified as indicated in the following discussion.

The most common salts of commerce are the sodium, ammonium, potassium, barium, zinc, magnesium, chromium, aluminum, and antimony fluorides. The sodium, potassium and ammonium salts are used as preservatives and insecticides (a common roach powder contains essentially sodium fluoride). The use of sodium fluoride as a fireproofing agent was patented in 1924.[33] The production of aluminum from bauxite depends upon cryolite and quoting Edwards, Frary, and Jeffries,[20] "The aluminum industry is not dependent upon Greenland for its supply since cryolite can be readily made synthetically." It has been stated that the synthetic cryolite has replaced a considerable amount, if not all, of the natural material in the aluminum industry.[54] The fluoride process for metallic beryllium[49] uses a $NaF\text{-}BeF_2\text{-}BaF_2$ mixture, and the oxide process for magnesium uses a mixture of $NaF\text{-}BaF_2\text{-}MgF_2$.[49] Opacifiers for glass and enamels include sodium, aluminum, and zinc fluorides, and sodium silicofluoride. Zinc fluoride besides being a good opacifier and fluxing agent is used in insecticides and for wood preserving. The textile printing and dyeing industries use the chromium salt.

Antimony trifluoride within recent years has assumed major importance as it is the basis for the manufacture of the new commercial organic fluorine compounds that have appeared on the market, notable among which is the new refrigerant dichlorodifluoromethane (Freon).

The acid salts of sodium, potassium, and ammonium fluoride find use as antiseptics, as laundry sours,[10] in the preparation of fluorine, in the etching of glass, and in chemical analysis.

Some of the miscellaneous salts have been successfully used for many purposes. Lithium, strontium, cerium, iron, and copper fluorides have been suggested as useful in ceramics. Cerium fluoride is used in carbon arc electrodes,[61] and silver fluoride in pharmaceutical preparations.[52] Lead fluoride has been patented as an under water paint pigment.[59] Boron trifluoride is used in the synthesis of organic fluorine and non-fluorine-containing compounds; it is also an excellent polymerizing agent. The silicofluorides find a multitude of uses, principally as insecticides,[19] concrete and wall hardeners, and laundry sours; however, they are chiefly derived from the superphosphate industry as a by-product.

The advent of Freon (dichlorodifluoromethane) as a refrigerant in 1930 directed attention to a new field of development. Other refrigerants, new non-fading dyes, solvents, electrical condenser insulators, etc., containing fluorine have made their appearance and for certain purposes are superior to anything else that is available. In general, they possess unusual stability or low toxicity or low flammability or non-corrosive properties or a combination of these. Two general methods are used for commercial syntheses,[12, 45] (1) the replacement of a halogen atom by fluorine through the reaction with anhydrous antimony trifluoride with a catalyst, usually $SbCl_5$, and (2) the introduction of fluorine into an aromatic nucleus by the decomposition of a diazonium fluoride.

The first reaction is applied to the aliphatic type of compounds and to aliphatic side chains in aromatic compounds. This reaction was discovered by Swarts in 1892.[69] The degree of substitution depends upon the conditions. The yields in many cases are very good; the new refrigerants, and some of the new

$$3\,CCl_4 + 2SbF_3 \xrightarrow{\text{catalyst}} 3CCl_2F_2\,(\text{Freon}) + 2SbCl_3$$

$$C_6H_5CCl_3 + SbF_3 \xrightarrow{\text{catalyst}} C_6H_5CF_3 + SbCl_3$$

solvents, and dye intermediates are made by this reaction. Monel metal, copper, and iron serve very well for equipment construction if certain precautions are taken.

The second method is the only practical means of introducing fluorine into an aromatic nucleus. An amine is diazotized by sodium nitrite in hydrofluoric acid solution and then decomposed to the fluorine compound. A modification of this method[4] appeared in 1914 and was extended by Schiemann[3] in 1927 which

$$C_6H_5NH_2.HF \xrightarrow{\text{HONO}} C_6H_5N_2F \longrightarrow C_6H_5F + N_2$$

involves the precipitation of the diazonium salt by HBF_4 as a diazonium borofluoride. The diazonium borofluorides are surprisingly stable; they generally have a definite decomposition temperature, and the yields are unusually good. The boron trifluoride can be reabsorbed in a water or alkaline wash and used over

$$C_6H_5N_2X \xrightarrow{HBF_4} C_6H_5N_2BF_4 \xrightarrow{\text{heat}} C_6H_5F + N_2 + BF_3$$

again. This borofluoride method has also been improved by using the $NaBF_4$[51] where a fairly neutral solution is necessary for satisfactory yields.

The first commercial use of an organic fluorine compound was in mechanical refrigerators[53] for household

purposes. Dichlorodifluoromethane (CCl_2F_2 "Freon" or "F-12" or "Kinetic No. 12") is the most common, and dichlorotetrafluoroethane ($CClF_2CCF_2$ or "F-114"), trichloromonofluoromethane (CCl_3F or "F-11" or "Carrene") are other new refrigerants. The life, fire, and explosive hazards[58] of these compounds are very low, and they are practically non-corrosive to metals. Freon is being used also in air conditioning equipment for buildings, mines, etc. Approximately 1,700 tons of acid spar were used in the manufacture of the new refrigerants in the first ten months of 1935.[14] Since these types of compounds are non-flammable, various members have been patented as fire extinguishers.[7, 27, 48] Mention has also been made of the probable value of some of the chlorofluoroalkanes as anesthetics,[27] solvents,[13] and insecticides.[64, 65] A variety of chlorofluoroethanes have been patented as insulating and cooling dielectrics[21, 71] for electrical apparatus such as transformers, capacitors, switches, etc., where the explosion and fire hazard, dielectric constant, corrosion, decomposition, and freezing factors must be considered.

The aromatic fluorine compounds are finding many diversified uses. Fluorobenzene is a good solvent in shoe polish,[63] the sodium salt of p-fluorobenzoic acid[52] as well as other compounds[18] has been suggested for use in the field of pharmacy. Numerous patents have been issued on dyes containing fluorine; the benzotrifluoride, and fluorobenzene derivatives are the most common.[22, 23, 29, 30, 31, 34, 35, 36, 38, 57, 70] Color photography has found use for some of the diazonium borofluorides.[41] The CF_3 group, which appears to have a color value similar to that of a nitro group, is of commercial interest because of its extreme stability.

The fluorspar deposits of Hardin and Pope counties in Illinois[5] and of adjacent counties across the Ohio River in Kentucky[17] are our principal sources of fluorspar and account for approximately 93 per cent. of U. S. production to date, Illinois having provided a little over one-half of this amount. Burchard[15] has given an excellent account of the production and reserves of fluorspar in the deposits of the western states. This fluorspar makes up the other 7 per cent. of the U. S. production but on account of its geographical position does not give noticeable competition to Illinois-Kentucky fields. Figure 2 shows the location of fluorspar deposits in the United States. A relatively small per cent. of the fluorspar mined in this country is of acid grade. A patented flotation process[72] for the manufacture of this grade is controlled by the Aluminum Company of America whose subsidiary, the Aluminum Ore Company, has a plant for the operation of the process at Rosiclare, Illinois.

The Economic Situation of Acid Spar

Although the United States produces approximately 40 per cent. of the world's fluorspar, more than 80 per cent. of the acid spar consumed in the United States during the past four years was imported (see Table IV). Due to lower foreign production costs, to

Table IV—"Acid Spar" Produced, Imported, and Consumed in the United States for the Manufacture of Hydrofluoric Acid and Derivatives (1926-1935)*

Year	Domestic production in tons (shipped from mines)	Importation in tons	Per cent. imported	Total consumption in tons
1926	3,410	8,861	72	7,591
1927	3,748	7,500	67	15,500
1928	15,946	3,300	17	20,500
1929	12,906	6,634	34	15,600
1930	9,834	3,643	37	20,500
1931	4,386	8,504	66	12,000
1932	738	6,152	89	7,000
1933	950	3,971	81	7,800
1934	1,666	8,982	84	11,000
1935	4,444	7,715	70	12,900

* Data taken from the Minerals Yearbooks, U. S. Bureau of Mines.

comparatively low ocean freight rates, and the very high freight rate from the Illinois-Kentucky producing district to the eastern seaboard, a number of foreign countries deliver acid spar with tariff paid to chemical plants on our eastern seaboard at a price below that for which the Illinois-Kentucky operators can produce and

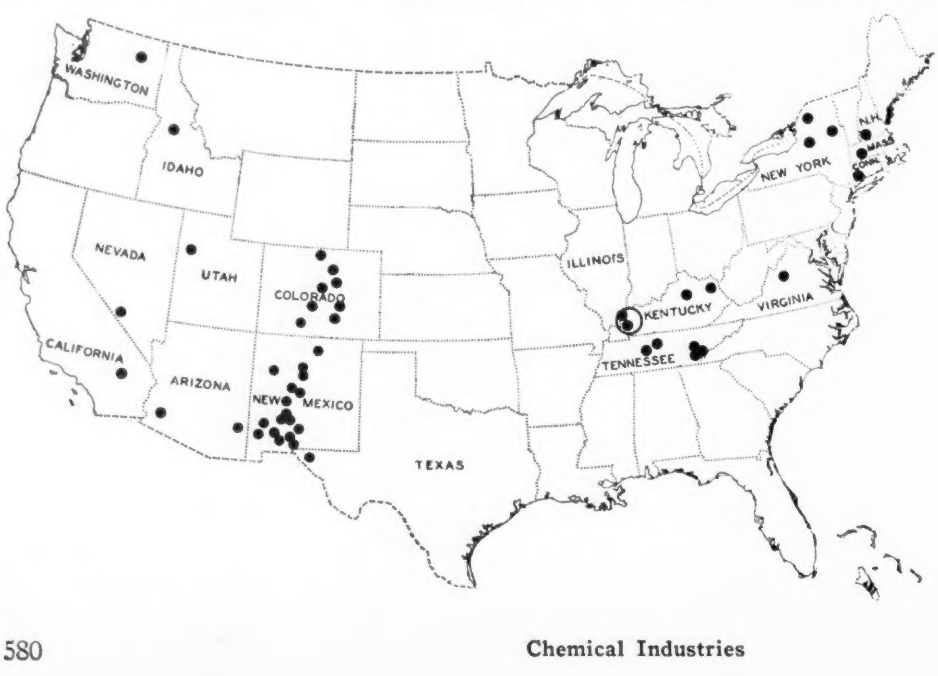


Figure 2. Distribution of fluorspar in U. S.; ninety per cent. of production being within circle of Kentucky and Illinois.

deliver. The tariff act of 1922 increased the duty on fluorspar from $1.34 per short ton to $5.00 per short ton. By Presidential Proclamation under section 315 and effective November 17, 1928, the duty was increased to $7.50 per net ton on fluorspar containing 93 per cent. or less calcium fluoride. On June 8, 1930, the duty on fluorspar containing 93 to 97 per cent. calcium fluoride (CaF_2) was raised from $5.00 to $7.50 per short ton. This increase, however, did not change the duty on acid spar so that this grade is imported with a duty of $5.00 per short ton. This enables the foreign producer not only to capture most of the acid spar market on the eastern seaboard, but also in some cases to sell acid spar in competition with the ceramic grade.

In considering fluorspar as a chemical raw material providing the element fluorine there are two other sources; (1) the fluorapatite ($CaFCa_4(PO_4)_2$) of our phosphate deposits contains approximately 3.7 per cent. fluorine,[40] and (2) the mineral cryolite (Na_3AlF_6) containing 54 per cent. fluorine. At the present time these fluorine containing minerals offer very little competition to the major uses of fluorspar because of (1) the large fluorspar reserves, (2) the difficulty of recovering the fluorine in a readily usable form from the phosphate industry, and (3) the high cost and limited amount of cryolite available.[28]

Although during the past five years rapid progress has been made, particularly in the synthesis of organic fluorine compounds, this branch of fluorine chemistry is in its infancy. Only a few aliphatic fluorine compounds with more than two carbon atoms are known and comparatively less information is available concerning fluorine compounds in the aromatic series. The "key chemical" for all of these compounds is hydrofluoric acid. This substance is an extreme irritant to the skin, producing troublesome "burns" which are slow to heal, it is poisonous, and it is also very corrosive to most of the usual materials of construction for laboratory and plant equipment. Altogether, it is a hazardous chemical to handle, and only those laboratories and firms having exceptional facilities, adequate funds, and a personnel with excellent and unusual technique can carry on research in this field. For these reasons, the principal development of industrial fluorine compounds has taken place in the laboratories of large chemical organizations. This is indicated by the scattered, meagre articles and the advancement shown by chemical patents. When one considers the expansion of the synthetic organic chemical industry since the World War in such fields as solvents, plastics, pharmaceuticals, etc., and the progress in organic fluorine chemistry during the past five years, it is reasonable to expect an increasing use of fluorine-containing compounds in industry.

Bibliography:

1. Andrews, A. I. "Enamels," pp. 50-51, The Twin City Printing Co., Champaign, Ill. (1935).
2. Anonymous, Ind. Eng. Chem. News Ed. *14*, 252 (1936).
3. Balz, G. and Schiemann, G. Ber. *60*, 1186 (1927).
4. Bart, H. Ger. 281,055 (Oct. 12, 1914).
5. Bastin, E. S. "The Fluorspar Deposits of Hardin and Pope Counties, Illinois," Bull. 58 (1931), Illinois State Geological Survey.
6. Becker, H. "Die Verwendung des Flusspates bei der Herstellungen von Portland zementen," Dessau (1924).
7. Bichowsky, F. R. U. S. 2,021,981 (Nov. 26, 1935).
8. Bishop, H. B. U. S. 1,150,415 (August 17, 1915).
9. Bishop, H. B. U. S. 1,812,770 (June 30, 1931).
10. Bishop, H. B. Chem. Industries *36*, 120 (1935).
11. Blayney, J. M. Fluorspar: Proposed Negotiation of Foreign Trade Agreement with Spain. Nov. 5, 1934.
12. Bockemüller, Wm. "Organische Fluorverbindungen," Verlag von Ferdinand Enke, Stuttgart (1936).
13. Booth, H. S., Mong, W. L., and Burchfield, P. E., Ind. Eng. Chem. *24*, 328 (1932).
14. Bowles, O. Mining and Met. *17*, 30 (1936).
15. Burchard, E. F. "Fluorspar Deposits in Western United States," Tech. Pub. No. 500 (1933). Am. Inst. Mining and Met. Engrs.
16. Church, L. Chem. & Met. Eng. *43*, 366 (1936).
17. Currier, L. W. "Fluorspar Deposits of Kentucky," Kentucky Geol. Survey (6) *13* (1923).
18. Deichsel, S. (to Winthrop Chem. Co., Inc.) U. S. 2,002,447 (May 21, 1935).
19. DeLong, D. M. Ohio J. Sci. *34*, 175-200 (1934).
20. Edwards, J. D., Frary, F. C., and Jeffries, Z. "The Aluminum Industry," Vol. I, p. 283, McGraw-Hill Book Co., Inc., New York (1930).
21. Elsey, H. M. (to Westinghouse Electric & Mfg. Co.) U. S. 1,953,-216 (Apr. 3, 1936).
22. Engelmann, M. (to E. I. du Pont de Nemours & Co.) U. S. 1,999,-185 (Apr. 30, 1935).
23. Engelmann, M. (to E. I. du Pont de Nemours & Co.) U. S. 2,029,-315 (Feb. 4, 1936).
24. Fickes, E. S. U. S. 1,288,400 (Dec. 17, 1918); 1,316,569 (Sept. 23, 1919).
25. Fredenhagen, K. Ger. 529,538 (Aug. 2, 1930).
26. Fredenhagen, K., Klatt, W., and Kunz, H. Z., anorg. allgem. Chem. *218*, 161-5 (1934).
27. Frigidaire Corp., Brit. 359,997 (Oct. 26, 1931).
28. Gibbs, A. E. Chem. Industries *38*, 471-76 (1936).
29. Hitch, E. F., Dahlen, M. A., and Friedrich, M. E. (to E. I. du Pont de Nemours & Co.). U. S. 1,982,661 (Dec. 4, 1934).
30. Hitch, E. F., Dahlen, M. A., and Friedrich, M. E. (to E. I. du Pont de Nemours & Co.) U. S. 2,023,590 (Dec. 10, 1935).
31. Hoffa, E., and Muller, F. (to General Aniline Works, Inc.) U. S. 1,999,610 (Apr. 30, 1935).
32. Holt, L. C. and Mattison, E. L. (to Kinetic Chemicals, Inc.) U. S. 1,967,244 (July 24, 1934).
33. Hopkins, N. W. U. S. 1,507,181 (Aug. 2, 1924).
34. I. G. Farbenind. A.-G. Brit. 385,295 (Dec. 19, 1932).
35. I. G. Farbenind. A.-G. Brit. 404,794 (Jan. 25, 1934).
36. I. G. Farbenind. A.-G. Brit. 405,144 (Feb. 1, 1934).
37. I. G. Farbenind. A.-G. Fr. 766,283 (June 25, 1934).
38. I. G. Farbenind. A.-G. Fr. 774,910 (Dec. 17, 1934).
39. I. G. Farbenind. A.-G. Fr. 745,293 (May 8, 1933); Ger. 575,593 (May 22, 1933); Brit. 395,227 (July 13, 1933); Fr. 786,112 (Aug. 27, 1935).
40. Reynolds, D. S. and Jacob, K. D. Ind. Eng. Chem. *25*, 1321 (1933).
41. Kalle & Co., A.-G. Brit. 402,737 (Mar. 5, 1932).
42. Kinetic Chemicals, Inc. Brit. 391,166 (Apr. 13, 1933).
43. Klatt, W., Z. Physik, Chem. *A173*, 115-20 (1935).
44. Ladoo, R. B. "Fluorspar, Its Mining, Milling, and Utilization," Bull. 244, U. S. Bureau of Mines (1927).
45. Lange, W. Chem. Zeit. *59*, 393 (1935).
46. Lazier, W. A. (to E. I. du Pont de Nemours & Co.) U. S. 1,996,115 (Apr. 2, 1935).
47. Lea, F. M., and Desch, C. H. "The Chemistry of Cement and Concrete," pp. 123, 127, Edward Arnold & Co., London (1935).
48. Malzar, A. C. Fr. 782,140 (May 28, 1935).
49. Mantell, C. L. "Industrial Electrochemistry," McGraw-Hill Book Co., Inc., New York (1931).
50. Medenbach, F. "Des Flusspat, Vorkommen, Gewinnung, Verarbeitung und wirtschaftl. Bedeutung," pp. 134-140, Verlag: Mineral-Gesellschaft m.b.H., Weilburg, Germany (1934).
51. Meigs, F. M. (to E. I. du Pont de Nemours & Co.) U. S. 1,916,327 (July 4, 1933).
52. Merck's Index, 4th Edition, Merck & Co., Inc., Rahway, N. J. (1930).
53. Midgley, T., Jr., and Henne, A. L., Ind. Eng. Chem. *22*, 542 (1930).
54. Miller, R. M. "A Survey of the Aluminum Industry and Its Metallurgical Processes," Bull. D., p. 12, State College of Washington, School of Mines & Geology (1935)
55. Minerals Yearbook 1931, Part II, pp. 1-21, U. S. Bureau of Mines (1932).
56. Minerals Yearbook, 1935, p. 1092, U. S. Bureau of Mines.
57. Müller, F. U. S. 1,929,328 (Oct. 3, 1933).
58. Nuckols, A. H., et al. "The Comparative Life, Fire, and Explosion Hazards of Common Refrigerants," Nat. Board of Fire Underwriters, Miscel. Hazard No. 2375 (1933).
59. Paindavoine, L. Fr. 754,721 (November 13, 1933).
60. Paindavoine, L. Brit. 420,308 (Nov. 29, 1934).
61. Petar, A. V. "Rare Earths," Inf. Cir. 6847, p. 21, U. S. Bureau of Mines (1935).
62. Pogue, J. E. "Optical Fluorite in Southern Illinois," Bull. 38, pp. 419-27 (1922) Illinois State Geological Survey.
63. Private communication to authors.
64. Roark, R. C. "An Index of Patented Mothproofing Materials," U. S. Dept. of Agriculture, May 1931.
65. Roark, R. C. "A Second Index of Patented Mothproofing Materials," U. S. Dept. of Agriculture, Feb. 1933.
66. Schwerin, L. Metals and Alloys, *5*, 61-66, 83-88, 118-123 (1934).
67. Simons, J. H. Chem. Rev. *8*, 213-35 (1931).
68. Stuckert, L. Cer. Age *18*, 314-16, 321 (1931).
69. Swarts, F. Bull. sci. acad. roy. Belg. (3) *24*, 309 (1892).
70. Thomae, H., Modersohn A., Müller, F., and Muth, F. (to General Aniline Works, Inc.) U. S. 2,015,204 (Sept. 24, 1935).
71. Westinghouse Electric & Mfg. Co., Brit. 425,920 (Mar. 25, 1935).
72. Williams, J. C. and Greeman, O. W., U. S. 1,785,992 (Dec. 23, 1930).

This article published with the permission of the Chief, Illinois State Geological Survey, Urbana, Illinois.

Preventing Contamination in Tank Cars

By G. R. Milligan

The B. F. Goodrich Co.

TODAY, many manufacturers, particularly those of soap and rayon, demand a caustic soda of a very low iron content due to the fact that high iron causes a discoloration of the finished product.

For years caustic manufacturers have produced a product of extremely low iron content. However, since the bulk of the caustic for the soap and rayon industries is transported in tank cars, the iron content of the soda was increased a great many times due to the iron pick-up from contact with the walls of the metal tanks. A practical and economical solution is to paint the interior surface of the tank car so that the caustic will in no way contact the metal.

Due to the nature of the material handled and severity of service, it is impossible to use an ordinary oil type paint for this purpose. To insure economical application and long life, a paint should meet the following requirements:

1. Paint must successfully withstand a 50 per cent. caustic concentration.
2. It must be able to stand action of caustic under temperatures up to 220° F. Such temperature is often reached when thawing out caustic with steam.
3. Inasmuch as this 50 per cent. caustic solution crystallizes when subjected to cool temperatures, paint must be able to stand up under the moderate abrasive action created by the crystals.
4. Paint should be of a type that requires minimum preparation of the metal prior to application, thereby eliminating necessity for sandblasting. This feature should apply in respect to both old and new tank cars.
5. A paint that can be applied by brushing or spraying and will not form a "spray dust" or web.
6. It should be a white or light color so that any flaws or spots can be readily detected. Also, should any of these light colored paint flakes be carried into the caustic they would prove less objectionable than if of a dark color.
7. Vapors from paint should be non-toxic as it is desirable to work without aid of gas mask.
8. Paint should be one that can easily be patched.

In preparing cars for painting, which have already been in caustic service, it will be found that the surface is covered with a black oxide. This can be removed by washing with hot water and then scrubbing with a stiff wire brush. The dust and scale resulting should be removed with a vacuum cleaner.

It has been found advisable to apply the primer, which is composed of a dilute form of the paint, with a brush. This removes any dust remaining and insures paint getting into all cracks, crevices and seams.

To obtain a satisfactory surface three or four coats of paint are required in addition to the primer and the paint should be allowed to dry thoroughly between coats. Length of drying time will depend upon the season and the temperature.

Although subsequent coats may be applied by spraying, this method of application presents a problem. Considerable "fog" is bound to result in the spraying operation. This means that workmen must wear gas masks. If paint is applied by brushing, a good blower will supply sufficient air for working comfort.

A simple but effective ventilating system can be made by piping the air from a unit heater, located inside the plant, directly to the tank car. Connection between heater and car is made with a sheet metal duct. Distribution of air to both ends of car is accomplished with a metal tee. That section of the duct passing through opening at top of tank car is made of cloth so that workmen can enter and leave car by simply collapsing it. One of the primary advantages of this system is that during the winter months heated air can be supplied which not only contributes to the worker's comfort but also speeds up drying operations.

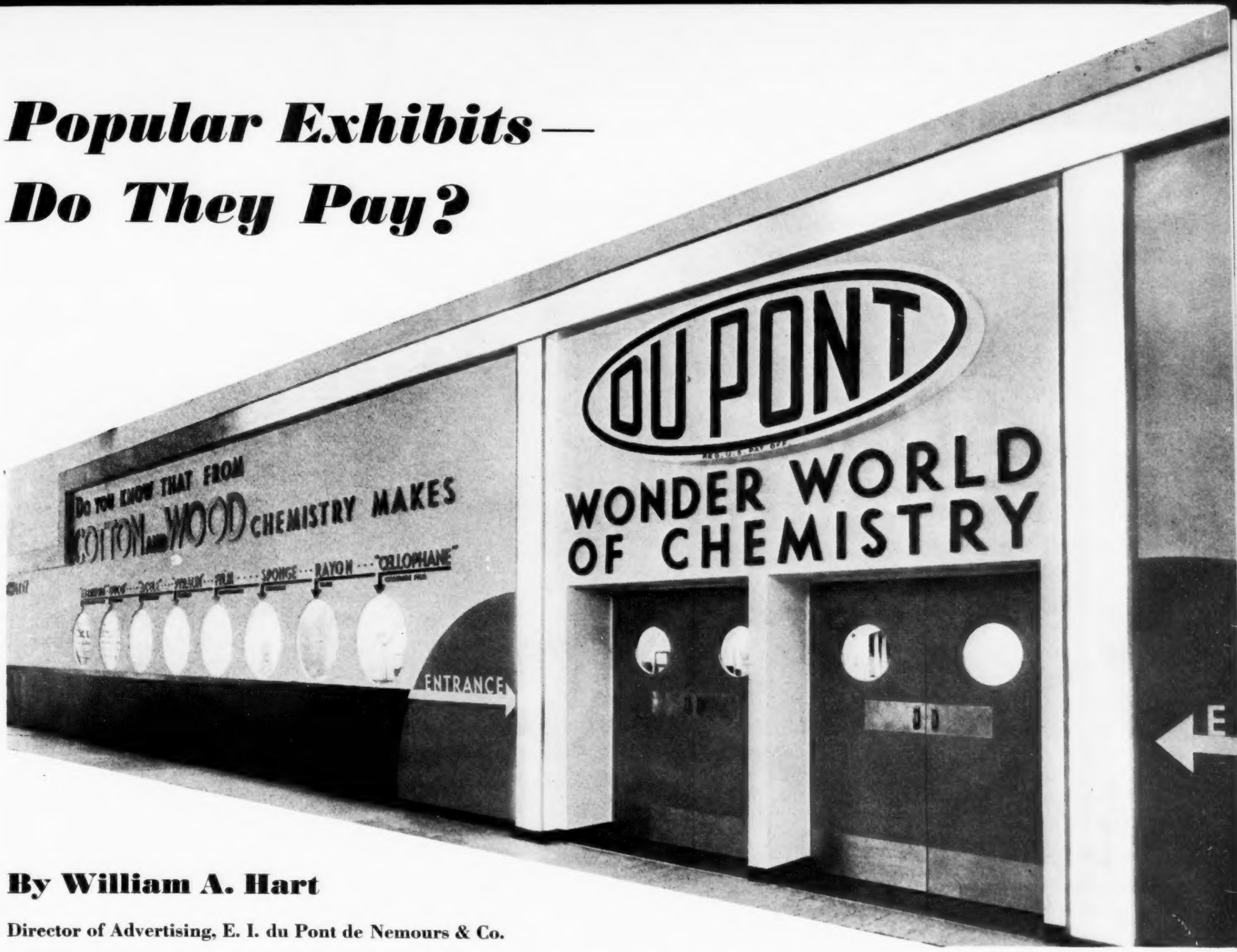
One of the several special paints offered for caustic service, unlike ordinary paints and lacquers, contains no oil nor nitro-cellulose. Its base is a rubber isomer. It possesses exceptional adhesion, has many of the elastic properties of rubber, contains the well-known chemically resistant properties of rubber, produces a film that is not water absorbent, and is rapid drying.

The life of this Acidseal in caustic tank car service is approximately a year and a half. Under ideal conditions it would last a considerably longer period. Here are a few of the abuses which are to be avoided if longer paint-life is to be obtained:

1. If steam jet is injected into tank car to thaw caustic, it is certain to result in injury to paint. Contact of live steam with paint will cause blistering, and chipping will also result if jet is permitted to strike surface.
2. Tank cars are equipped with coils for the thawing of caustic by means of low pressure steam. Oftentimes high pressure steam is used which raises temperature to a point where it injures the paint and may also boil the caustic.
3. Boiling liquids should not be used to clean out the tank cars. The water vapors resulting diffuse through the paint and cause blistering.
4. If customers follow the practice of rinsing out cars with water before returning to manufacturer they should be advised to make sure that the car is carefully drained so that it will not be shipped back with water standing in the bottom. Pure water diffuses through paint faster than a liquid containing considerable dissolved material.

Acidseal paint has proven equally successful in connection with caustic soda storage tanks. It now is possible for both manufacturers and users of caustic to store surplus quantities of this product without endangering its low iron content.

Popular Exhibits— Do They Pay?

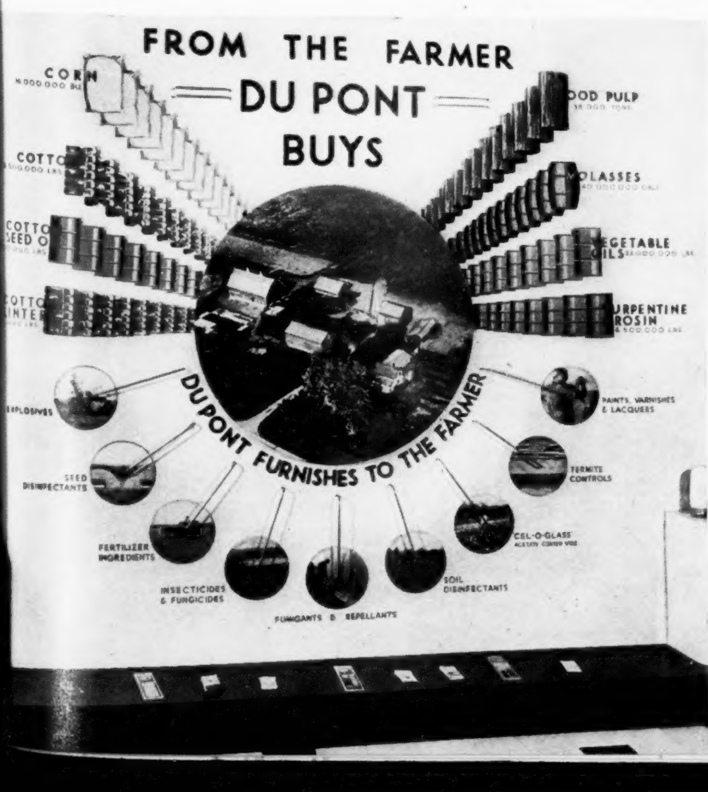


By William A. Hart

Director of Advertising, E. I. du Pont de Nemours & Co.

WHEN this article appears, the 1936 Texas Centennial Central Exposition in Dallas will have come to a close.

About six million visitors was the gate for the 1936 season. While this number is considerably below the original forecasts, it should be remembered that the Southwest is not densely populated, as compared with the East and Midwest. The area surrounding Dallas, within a radius of 400 miles was considered by the Exposition officials to be their "market." This area comprises one-sixth of the continental United States territory, and a population of twelve million, or somewhat less than one-eleventh of the total population.



Although the du Pont Company has exhibited its products in a permanent exhibit in Atlantic City for many years, and has had other exhibits such as the one at the Memphis Cotton Show and the Springfield Exposition, the Company's participation in Dallas was its first experience in a large exposition. Naturally, this has prompted many people to ask whether the Dallas participation has proved worth while from the Company's view-point. The answer is distinctly "yes," although that does not mean that the Company will, necessarily, participate in all other national expositions.

The Dallas exposition was especially attractive because a large part of the du Pont Company's manufacture uses raw materials which originate in the South, a share of which comes from Texas itself; some of these materials are sulfur, cotton staple, cotton linters, vegetable oils, turpentine, salt, and coal. Moreover, such du Pont products as heavy chemicals, seed disinfectants, insecticides, fertilizer materials, dyestuffs, solvents, paints, lacquers, explosives, rayon, cellulose film, are consumed in the South in large quantities. Finally, approximately a third of the Company's recent plant investment in new plants has been in the South.

The du Pont exhibit was purely educational and did not depend upon musical entertainment or stunts for drawing power. The "Du Pont Wonder World of Chemistry," as the exhibit was named, was a presentation of du Pont research through the combined and carefully coordinated media of exhibits, lectures, and talking motion picture. For example, each of the six staff lecturers described an important group of products, say products of cotton and wood—how these products were made and their uses. Particular stress was put on the part which du Pont products play in everyday life.

About half of the visitors were women, and the largest occupational group was naturally farming. School teachers, business executives, and professional groups were well represented. The typical visitor spent at least ten to twenty minutes going through the exhibit and many spent an additional twenty minutes in the motion picture theatre. Only a small proportion of visitors merely took a look and then hastened away.

There is no question but that a large proportion of people are interested in science and are glad to listen to informative talks provided there is fast-moving action, and provided there is no immediate sales objective. The thousands of inquiries and the nature of comments indicate beyond question that the great mass of the public is friendly to industry, once they are given the opportunity to understand its workings.

Every Chemical Worker Should Know

By John S. Shaw

Manager, Safety and Service Department, Hercules Powder Company

Courtesy of National Safety Council

WHEN selecting chemical workers we should choose men not only of good health, but of sound sense, and if possible, they should have at least the equivalent of a high school training so that they will understand their instructions and the reasons therefor.

1. A chemical worker should be thoroughly familiar with the location and use of water hydrants, shower baths, fire blankets, exits, and all fire fighting equipment. He should be shown through the medical or first aid department and understand the importance of reporting promptly for first aid treatment for injury resulting from contact with any chemical, as well as for physical injuries. He should be trained in first aid and his training reviewed at least every three years. Competent instructors should give the training. Instructive literature should be used from the American Red Cross, the Bureau of Mines, the National Safety Council, and other reliable sources.

2. The chemical worker should keep in a safe and proper place, always ready for use, any protective equipment supplied him, such as goggles, rubber gloves, aprons, boots, or other articles. Gas masks whether they are hose or canister type, should be tried on at regular and frequent intervals so that they will be known to be ready. A canister, if equipped with a recording device showing the strength of the chemicals contained, should be discarded when half or more discharged. If there is no recording meter on the canister, it should be discarded at the end of each year. If used, it should be discarded immediately afterward. Canisters should be kept sealed until used, but the sealing must not be forgotten when the mask is put into use. Loss of life has occurred through failure to remove the adhesive seal from the bottom of the canister in times of emergency and excitement.

The hose mask should be kept in good condition, hose and fittings tight, and no part of the equipment used if cracked, old, or in a questionable condition. There should be sufficient hose to reach fresh air, and if the hose mask is used where the maximum length of hose required indicates the need of an air pump, the air pump should be inspected regularly to see that it is in good working condition; likewise, the steel tiller rope or chain and harness which are to be attached to the body of the operator should be carefully inspected. Thorough drills in the use of such equipment may mean the saving of life and the chemical worker should realize his personal responsibility to rehearse for emergencies. Supervision should see that he does this.

I should like to emphasize the importance of mental rehearsals of emergencies. Every chemical worker should not only experience physical rehearsals, such as safety drills, and life saving, but he should each day at his work imagine emergencies which might arise and mentally rehearse what he would do if something should go wrong.

3. Exits should never be blocked at any time, not even momentarily, in the chemical plant, for the unforeseen may happen at any time, when quick escape may be necessary.

4. When going on duty, the chemical operator should satisfy himself that the operating equipment he is about to use is in good condition and working normally. He may receive warnings or instructions from the previous shift operator, and from his working superior, but, at the same time, he should take nobody's word for the "lining up" of valves on chemical, gas, or liquid lines, electrical switches, etc. He should go over his equipment and personally "line up" his own valve setup, or whatever it may be.

In handling chemicals, nobody's word must be taken by the man who is responsible for the moving of a chemical from one place to another as to how the set-up exists, unless, of course, it be through long distance and then by specified methods of signalling, such as telephone, bell, whistles, etc., where the set-up at the other end is the duty of a fellow-operator.

5. Oftentimes, spills of liquid chemicals occur and when an operator observes a wet place on the floor, he should realize that he must not look up until he has retreated to a point where there will be no danger of splashes into his eyes or onto his body. This is an old rule of chemical workers, handed down from the age when chemical leaks and drips were frequent.

6. The chemical operator should realize that the control features on all chemical equipment are there not only for operating purposes, but, in most cases, for safety; and in the event that any pressure or vacuum gage, thermometer, or what not indicates abnormal change or a bad condition, he should take steps immediately to rectify the conditions as specified by his superior, usually by reporting the condition promptly.

However, there are emergencies when he must safeguard the situation before reporting. It is taken for granted that these emergency conditions are provided for in his training. It is impossible to do more than generalize on this without the danger of misunderstanding.

7. While "a little knowledge is a dangerous thing," the more the worker knows about the reasons for following prescribed methods, the better worker he is. He should acquaint himself with the reasons, and, if possible, be familiar with the simple chemistry and physics of his job, and not be afraid to ask questions; but he should never experiment without the advice of proper authority.

Chemical control should not be treated lightly. Any changes to be made in the chemical process should take place only after the careful consideration and direction of those competent to make such changes.

8. When leaving his work, or outlining his duties to another at the termination of his shift, the chemical worker should fully familiarize his successor with the condition of the equipment and the status of the chemicals in process. This should be in writing in a log book of operations. By no means should he leave any questionable condition whereby his fellow worker may meet with a mishap. It is his full responsibility to live up to this and to consider it as sacred as anything in life. The slightest deviation from this practice, whether deliberate or otherwise, has meant disaster to chemical workers and monetary loss to plant owners.

9. The chemical plant is no place for monkey business or horseplay. It must be remembered that the practical joker in chemical work may be a potential killer.

I have known chemical workers deliberately to plug condensers in order to see if their fellow workers could quickly discover and locate the trouble. Such methods should not be resorted to, even with only water in the equipment.

10. The chemical worker should thoroughly appreciate the fact that safety is sacred, that the safest method is generally the best method, and that the best method always embraces the safest way.

Methanol From Natural Gas

Methyl alcohol is obtained from natural gas by reacting air and natural gas mixtures in the presence of a copper catalyst at pressures from 2000 to 3000 lbs. per sq. in. at temperatures from 375° C. to over 500° C. Conversions of gas burned to methyl alcohol of 74% are readily obtained at low oxygen concentrations, together with a little formic acid and formaldehyde. Up to the present a copper catalyst is the best discovered. In general it has been found that there is an optimum temperature for optimum yield with any one mixture of air-gas, the temperature being higher the lower the oxygen content. Higher oxygen content leads to decreased yield. Effect of pressure is similar to that of temperature, maximum yields being obtained at intermediate pressures of the order of 2500 to 3000 lb. per sq. in.—Research Council of Alberta.

Citric Acid From Blackstrap Molasses

In a recent issue of *Facts about Sugar* a process for the manufacture of citric acid is described which utilizes blackstrap molasses. Fermentation is carried out in resin-lacquered trays containing shallow layers of bagasse (or beet pulp) impregnated with molasses mash. Bagasse is said to be a very suitable carrier for the fermentation agents since it can be used repeatedly. Trays are arranged in tiers of 6 in sheet iron chambers, and the heat of reaction causes a sufficient draught of air to maintain efficient fermentation. Citric acid is extracted from the liquor after fermentation by neutralizing with milk of lime and filtering, filtrate being heated to 115° C. to precipitate any calcium citrate which remains in solution, and this is recovered. Free acid is obtained by treating the salt with sulfuric and recrystallizing. Yield of acid on molasses is about 19%. Calcium citrate may be disposed of as such and averages 97% purity. Fermentation period is short compared to other methods and sterilization of the mash is unnecessary.

Notes on Corrosion

By John T. Morris

Supt., Franco-American Chemical Works

The records of many investigators reveal that corrosion gives visual evidence of its preference for the exposed angular surfaces of chemical equipment. Simplicity of design is truly an able ally in combating corrosion, and the circuitous path it traverses to attain its evil and costly end behooves the fabricator or chemical engineer to craft along simple lines.

A known resistant material is sometimes employed without sufficient thought being given to factors of much import, such as reaction temperatures, concentration, turbulence, etc., of the substance under process. To the uninitiated, the word corrosive suggests the noxious and acrid, but unfortunately that is only one expression of its malfeasance. Even neutral lubricating oils, because of oxidation and heat, break down into organic acids. Consider the sinister disintegration wrought on heavy metal equipment through electrolysis and galvanic action. This stray current corrosion problem sometimes manifests itself in every-day industrial construction when lead pipe or metal tubing is walled into concrete structures. This can be avoided by the insertion of non-conductive shields.

How costly seemingly trivial missteps can become recalls an instance where a coil 2 in. in diameter made up of approximately 160 ft. of ¼ in. copper pipe had been installed in a copper still at a cost of $1200.00. The equipment had been in operation only 24 hours when the heating coils were discovered to be leaking. Upon emptying and examining the equipment internally, an object about 3½ ft. in length and having a diameter of 7 in. was found athwart the pipes. Where the object had contacted the coils the metal was found to be perforated and paper thin. It was discovered that upon closing the top manhole the day before, a workman inadvertently knocked a short piece of 1½ in. galvanized pipe into the still. Since the process as carried out required sulfuric acid, galvanic action did the rest.

Troublesome daily maintenance can many times be remedied efficaciously with standard equipment. For instance, a belt driven Duriron centrifugal pump in operation daily for the past decade has handled fifteen million gallons of acetic acid from glacial to 30% strength at temperatures varying from 20° to 50° C., flow 100 gallons per minute against a 40 ft. head. Now aside from periodical packing to prevent leakage, no rebuilding nor replacements were made. Of course, maintenance must also receive its due share of credit on this performance, but considering a first cost of $400.00, it was a profitable investment.

Balancing Power Demand and Supply in Chemical Plants

By C. H. S. Tupholme

TO obtain a suitable balance between power supply and consumption is to lower expenses through better utilization of the sources of power, and also of the plants for generating, transmitting and using the power, yet a certain flexibility must be provided in the whole system in case of breakdown or emergency service. The correct solution lies in the choice and layout of the generating plant, and it depends closely on the distribution of energy, on transporting the energy, and also on the possibility of storing energy or utilizing surplus energy.

Water power and natural gas can only be usefully employed where they are readily available. The same holds also for the poorer grades of fuel (lignite, dross, etc.), which are too cheap to stand high transport charges. On the other hand, the economical use of coal and oils of medium quality at places more or less remote from the mines or oil fields is now possible. The treatment of fuel, for example, by briquetting, low temperature carbonization, and distilling, has the same effect, in that these processes produce high grade fuels, the value of which bears a favorable ratio to the cost of transport over long distances.

Also means which must be adopted to store different kinds of energy affect the balance between supply and demand. Heat energy can only be transported comparatively short distances, so supply and demand must be balanced in the individual plant. For this purpose, heat storage, the use of high boiler pressures, and the utilization of waste steam have been taken up.

The chief advantage of centralization lies in larger electrical units for central stations, transformers and distributing apparatus, designed to suit the plant when fully developed. Generally, therefore, the preliminary scheme must be based on assumptions concerning the amount of electricity which will be required and consequently on probable requirements during the next few years or decades. Such assumptions may eventually prove quite wrong, in consequence of unforeseen or sudden developments, so that the utilization of surplus energy will then arise, compelling power stations, as at present in Japan, to work in collaboration with chemical manufacturers or even to start chemical plants themselves.

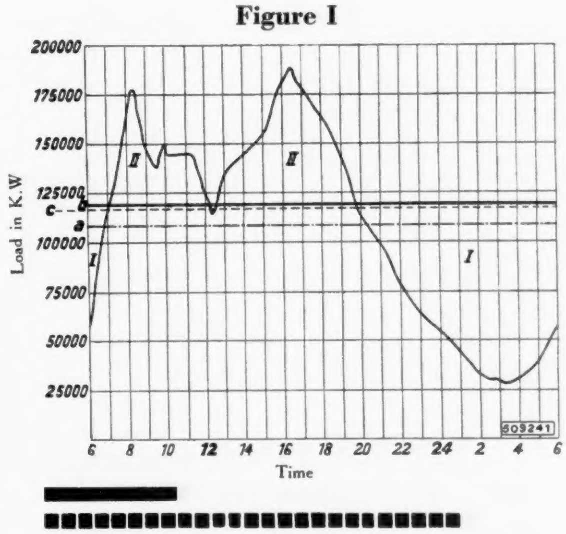
In the majority of cases the question is whether to extend or to combine existing systems of plants which are more or less antiquated or uneconomical. The engineer has now to work within much narrower limits of cost. This is a decisive factor, particularly in small plants. Thanks to the use of high steam pressures and the utilization of surplus energy, it is now possible to generate energy more economically in steam power stations, by adopting high-pressure, two-stage plants, allowing the generation of energy for power and heating purposes to be combined in an economical manner in industrial undertakings. Naturally the introduction of super high pressures also implies considerable savings in a station generating energy for power alone.

Hydro-electric storage plants are being adopted with advantage not only in conjunction with water power plants, but also with steam plants. There are today some large hydraulic energy storage power works under construction in Europe, which will work along with large steam power stations. Such storage works are economical, because they allow the steam turbines to be worked at a practically constant load, thus eliminating the great fluctuations in specific steam consumption shown by turbo generators working at different loads. As is well known, the specific steam consumption of a turbine rises sharply as the load on the machine decreases, until a point where it is uneconomical to raise steam in the large boilers to work the turbo generators. The three purposes which power storage has to fulfill are:

1. To compensate the peaks and valleys in the daily load curve.

2. To balance the extra load required during 5 days every week with the lower load required on Saturdays and Sundays.

Figure I



Cost of current for driving the pumps (I) — Receipts from energy generated by stored water (II)

a Mean load without storage
b Mean load with daily storage
c Mean load with daily and weekly storage

3. To obtain a balance between the maximum energy generated in certain months or seasons during the year and the maximum demand for energy in other months or seasons.

One example of the use of a daily storage plant can be seen from the load diagram (Fig. 1) taken on a day in winter in an electricity plant in the Ruhr industrial district where a large number of chemical plants operate. The line a shows the mean load on the power station without storage; the line b is the mean load with daily storage; and the line c is the load with daily and weekly storage. From this diagram it can be seen that the load on the power works fluctuates between 30,000 and 189,000 kw in the course of 24 hours. The line of mean load a, however, lies at only about 109,000 kw; the line b, when balancing the daily load with the help of a storage plant, lies at about 119,500 kw. With combined daily and weekly balance, if the total output is distributed over the whole 7 days, the mean daily load line c lies at only about 117,000 kw in consequence of the greatly reduced week-end consumption.

When Central Stations Are Worthwhile

The economy of steam central stations falls sharply under fluctuating loads since greatly varying consumption of fuel leads to great losses; in addition to that, considerable allowances must be made for keeping fires banked to have the plant ready for service. The initial cost of steam central stations varies greatly, decreasing as size increases; so that such stations are generally only economical when large plants are installed.

Considerable improvements in overall efficiency have been effected by the introduction of higher working pressures, intermediate superheating, feed-water preheating, the use of extracted steam, and the installation of air heaters. The most economical conditions of steam service cannot in general be determined at once, for they depend not only on the price of coal but also on the conditions of loading, the size of the plant, etc. A decisive factor is, of course, the increase in initial cost entailed by increasing the pressure; but this increase is not constant and also differs considerably for different types of boilers.

Economical Pressure Stage

The first sharply designed pressure stage would appear to be reached at about 515 to 580 lb. per sq. in. In order to prevent wear in the turbine blades and loss by friction in the low-pressure blading, intermediate superheating must be provided at higher pressures. The extra cost of the intermediate superheating plant, and also the loss of pressure in it and in the piping, is so great that a further rise in pressure to at first about 880 to 1020 lb. per sq. in. only can be regarded as economical.

According to the conditions of loading, the two-pressure arrangement gives the advantages of a super high-pressure plant at a comparatively reasonable cost. Particularly in extending existing plants, the combination of super high-pressure with normal pressure offers considerable advantages.

The gain obtained by increasing the pressure is due:

1. To the decrease in total heat content of steam in proportion to the increase in steam pressure for constant steam temperature.

2. To the increased adiabatic heat drop available for transformation into mechanical work in the steam turbine.

The lower steam (coal) consumption, together with the fact that the high-pressure boilers can be worked at a much higher rating than low-pressure units, allows the heating surface of the boilers and consequently also the additional installation cost for higher working pressures to be reduced. In the case of an extended plant it is very important to carry as much as possible of the base load on the new high-pressure units. The additional variable and peak load is to be carried by the low-pressure sets.

Further savings can be effected by using a two-pressure boiler plant consisting of a high-pressure part of 735 to 1610 lb. per sq. in., which takes up mainly the heat transferred by radiation in the furnace, and a less expensive low-pressure part not exposed to radiation and consequently not utilized so efficiently. The low-pressure steam produced in this part, for which raw water can be used for feeding, is partly used for preparing distilled make-up water for the high-pressure part by being condensed in a pre-heater, the remainder being used in the low-pressure turbine together with the exhaust steam of the primary back-pressure turbine located close to the boilers to minimize the expense of the high-pressure steam piping. This high-pressure turbine being used for the base load only, it does not need any special regulating device, hence it can be designed as simply as possible.

Best Type of Plant

A steam power plant with utilization of exhaust and extracted steam is by far the most favorable type to employ in chemical operations, since power can, so to say, be obtained from surplus energy. The economical limits for the working pressure in such plants lie much higher than in plants working with condensation, since the effect of the increase in pressure on power generation is more favorable in the former.

According to the conditions of working, the steam turbine or the reciprocating steam engine is the better to adopt, but no definite rules can be laid down for this. While for large stations and also in plants working with condensation or with back pressure, the turbine comes almost exclusively into consideration, the reciprocating engine proves suitable for small powers, particularly as the steam pressures increase. The somewhat higher cost of installing a reciprocating engine is paid shortly by the savings in working expenses. A reciprocating engine can also be governed more economically and more regularly than a steam turbine with nozzle

regulation. Special attention must be paid to purifying feed-water, *i.e.*, freeing it from oil; but this problem can nowadays be regarded as solved.

Solution of Practical Problem

An existing chemical plant recently decided to bring its steam power plant up-to-date and adopted the following solution: The electric current required was obtained from a 400 kw hydro-electric plant and any additional current was bought. Part of the plant is driven by hydraulic turbines, and the rest is driven by steam engines, one section of the plant having a separate steam engine drive. All five steam engines work with an admission pressure of 118 lb. per sq. in., admission temperature of 485 deg. F. and a back pressure of 10-14 lb. per sq. in. The exhaust steam, after it has been freed from oil, is used for heating purposes. Any extra demand, and also the heating steam for the hydraulically driven machines, is supplied from the old steam boiler working at a pressure of 88 lb. per sq. in. Boilers working at 132 lb. per sq. in. supply the steam for the steam engines, about 8000 to 11,000 lb. per hour, while the boilers at 88 lb. cover the requirements for heating steam, also 8000 to 11,000 lb. per hour.

As the hydraulic power plant and the existing boiler plant are no longer adequate it was decided to install a primary high-pressure steam power plant. The electric energy must be supplied by the primary engine plant as far as possible to suit existing arrangements, a fall of pressure from 470 lb. per sq. in. at 710 deg. F. to 140 lb. at 500 deg. F. being utilized in one half of the machines, and a fall from 470 lb. at 710 deg. F. to 29 lb. saturated steam in the other half of the machines. The exhaust steam at 147 lb. is led as working steam to the five existing steam engines, so that this part of the plant is regulated in accordance with the steam consumption of the low-pressure steam engines. The exhaust at 29 lb. from the primary engine is utilized directly as heating steam for various purposes. The governing of the second half of the plant depends therefore on the requirements for heating steam at 29 lb. When the plant is fully utilized the primary engine develops normally about 720 kw (maximum 880 kw), while the corresponding quantities of steam are at 147 lb., 485 deg. F., normally about 8000 to 10,000 lb. (maximum 14,000 lb.), at 29 lb. saturated steam, normally about 8000 to 10,000 lb. (maximum 14,000 lb.).

The high-pressure steam is raised in two single-bank upright water-tube boilers (each of 2,475 sq. ft. heating surface), 514 lb. per sq. in. working pressure and 755 deg. F. steam temperature, with a two-stage economizer plant at 147 and 558 lb. respectively for preheating the feed-water from 130 to 195 deg. F. in the first stage and from 350 to 410 deg. F. in the second stage. The quantity of steam raised by each boiler is 18,400 lb. per hour under normal conditions and 24,000 lb. per hour maximum.

The feed-water constant-pressure heat-accumulator makes it necessary to divide the economizer and the feed pumps into two stages, as mentioned above. This accumulator works on the following principle: if the demand for steam at 147 lb. falls, the superfluous steam at 147 lb. is used to raise a corresponding quantity of the feed-water contained in the accumulator to a higher temperature by means of condensing nozzles. The water level in the accumulator is kept constant and the feed-water is led off at the highest point, in order to have the temperatures of the water constant. The storage capacity has been calculated as sufficient to take the full boiler output for about 30 minutes. By this means in addition to complete utilization of the steam, a constant and therefore economical loading of the boiler is obtained.

Where Factory Covers Large Area

A different combination of power-heat requirements is found in chemical plants covering large areas. Calculation for such plants is based exclusively on the amount of heating required, according to the nature of heat and the physical properties of the medium transmitting it. Heat can, of course, now be transmitted by means of steam or water to comparatively great distances—up to several miles—without incurring much loss; but such a method will never attain the flexibility and handiness of electric transmission. Hence it is desirable to choose the least variable factor. The amount of power generated is only as much as can be obtained from the steam needed for central heating or other heating purposes.

Disposal of Surplus Energy

The methods adopted for disposing of surplus energy in power plants have greatly changed with the increase in ways in which it can be utilized. Cheap current during the night is often used in chemical plants. In addition to that, in some districts a considerable amount of electric energy can be used during the night for hot-water accumulators and steam storage boilers. Electric boilers are especially suitable for working at night, as their regulation is absolutely automatic, making attendance unnecessary.

Specially noteworthy is the utilization of surplus energy in dry cooling coke in gas-works, coke-oven plants, etc. The incandescent coke from the retorts, hitherto exclusively quenched with water, is cooled in a special plant by means of inert gases circulated through it. Quality of the resulting coke is improved in consequence of the absence of water. The inert gases heated by the coke give up their heat to a boiler, and are then re-circulated through the coke. The amount of heat recovered by this method is in certain cases so great that the total steam required in the works is thus raised exclusively.

Concluding the Symposium on

What Price Technical Service?

Donald D. Bradley
Presents the Distributor's Point of View

THE implications of the Robinson-Patman Law apparently have not extended to the domain of the chemical distributor so forcefully as to that of the manufacturer. The editorial in your October issue entitled "Technical Service" proposes questions which I think have little concern with our functions, although they are undoubtedly of interest to those manufacturers who maintain extensive service departments.

The distributor's "technical service" work is very largely a matter of troubleshooting. He helps the customer whose formaldehyde has polymerized in cold weather, or whose commercial aluminum sulfate is causing discoloration which the Iron Free grade will rectify. He offers a tip on how to prevent caking of T.S.P., and occasionally recommends butyl acetate instead of ethyl acetate to slow up drying time. But he has no time nor facilities for true research and can't afford such an expensive set-up for the purpose of sales promotion. And no discrimination could be imputed to the distributor who exercises his experience to help his customers with such advice as any business concern would offer the trade.

As a matter of fact, it appears that technical service of the troubleshooting type would never be discriminating, even though it involved considerable laboratory work, if comparable cooperation is available to other customers. And the Law confirms the old principle that a seller may choose or select his customers.

Technical Service designed to promote sales might be discriminatory if, by agreement, the results of the work are reserved solely to one customer. Under this heading might be classified the Fellowships which are established cooperatively by a manufacturer and a customer. Such research usually contemplates an opportunity for the customer to have sole right to the benefits arising from the development work.

It is my understanding the statute was enacted to correct some of the many abuses in the merchandising of resale goods, primarily consumer articles. The principles are broad and many seem to believe that they will have a far-reaching effect on sales in general. But there are few cases where a chemical manufacturer gives special customers five drums of caustic gratis with every carload or grants an advertising allowance as a means of obtaining a desirable account. And few complaints are heard that chemical prices are unjust. If it is true that the abused party must institute any action, it seems unlikely that many chemical cases will be tried.

As in the case of the N.R.A., we hear the Robinson-Patman Law being used as a convenient excuse for refusing a request which would be turned down on some other excuse if the Patman Bill had never been passed.

Many aspects of this bill are very broad and no dogmatic interpretation is possible. In my opinion the only possible course is to interpret the principles, guided by the dictates of one's own conscience as to what constitutes fair competition and what does not.

Dr. Gustavus J. Esselen
Likes the Dow Plan

THE editorial entitled "Technical Service" opens up a subject which has become of increasing importance in recent years. The manufacturer of chemical supplies has gradually assumed a burden of sales expense in the form of "sales service" which has in many cases seemed entirely unwarranted to an outside observer. It must have resulted in increased cost of the material to the consumer, and in certain instances has interfered with the proper field of the chemical consultant.

The announcement of the Dow Chemical Company, referred to in your editorial, is certainly a courageous step in the right direction, and if followed by other companies, should result in assigning the burden of "sales service" where it belongs; namely, to those who use it. It is our understanding that the Dow Company is still glad to furnish without charge complete technical information as to the properties and behavior of their products, but that they feel that prospective customers are asking a little too much when they ask them, for example, to design a plant in which to use Dow products.

Certainly the consultant will welcome this stand, and will hope that it will be taken by others as well, because where the service to the consumer is placed on a fair competitive basis, it will not infrequently happen that a consulting organization will be particularly well fitted from its own experience to apply the new chemical to the particular needs of the prospective customer.

Furthermore, in carrying out this service, the consultant would normally be acting primarily in the interests of the consumer, and accordingly the consumer could feel assured that he was securing the most advantageous material for his particular purpose.

On the other hand, there will be instances where the particular experience of the organization affiliated with the manufacturer will be of special value. In those cases the charge for the special service will be paid by the concern which reaps the advantage of it, and this charge will not be prorated over all of the consumers, regardless of whether they use the service or not.

We feel that the Dow Chemical Company has taken a distinct forward step, and one which could be taken to advantage by other manufacturers.

G. E. Hopkins

Notes Three Types of Service

WHILE, of course, there has been no exposition of the Robinson-Patman Law made by the courts, it appears doubtful if technical services of the sort mentioned will be considered discriminatory where they are offered to all customers alike.

Technical service as rendered at the expense of sellers may be divided into three classes.

First, assistance to the buyer in the application of established principles to the buyer's immediate problem. This includes such assistance as for example, the design by a chlorine manufacturing company of chlorine adsorption equipment for the use of a small paper manufacturer. The cost and results of such service can be definitely and easily evaluated, and if furnished gratis, puts the paper company which does not support technical service of its own at an unfavorable advantage over the paper company which maintains its own complete technical service. I believe this class of service may be paid for by the buyer, because it is easily evaluated and because otherwise it is a discrimination in favor of the more poorly staffed customer.

The second type of service might be classed as a sort of technical news service and consists of spreading through an industry the technique which has recently been proved as effective in a few instances, but which has not been acknowledged as a general principle. Usually the joint technical facilities of a buyer and a seller have found a new product to accomplish more efficiently an old requirement, or an old product has been successfully established in a new use. Here the cost of the technical service and its profit to the buyer can be evaluated with a fair degree of accuracy. Out of fairness to the buyer and seller who had the courage and imagination to stand the comparatively high development expense of the original trial, and because the service can be easily evaluated, I believe it would be fair for the buyer to pay for the service rendered.

The third class of technical service comes under the head of pioneering and is concerned with either the development of a new product more efficiently to fill an old requirement, or the use of an established product in a new way. The cost of such service is usually impossible to estimate in advance and the value resulting from it may range all the way from nothing in the case of complete failure after exhaustive research, to unexpectedly large rewards in those cases where the development work leads to possibilities not originally anticipated. This type of work cannot be undertaken efficiently by the buyer or the seller alone. Each has complete familiarity with his own problems and comparative ignorance of the problems of the other. The cooperative work of the two is dependent on, first, a mutual understanding of each other's problems, and second, ability on the part of both, in personnel and in equipment, to follow the common problem through to its conclusion. The chances of success are usually limited by the weaker of the two in technical ability and can be estimated by neither the buyer nor the seller working independently. Because this type of service cannot be evaluated before it is undertaken, and because it is necessary to the progress of both buyer and seller, I believe that this type of technical service should not be covered by regular service charges, but that both the buyer and seller contribute to the work as they are best equipped to assist in the common problem, with the full understanding that the relative contribution of the two parties will be based both upon the facilities available and upon the buyer's desire for a new or improved product and the seller's desire for a new market. Any attempt to saddle the expense of this type of technical activity on either the buyer or the seller by arbitrary or generalized regulations, will definitely impede progress and work against the best interests of all.

Oscar H. Wurster

Does Not Fear Big Business

YOUR editorial on "Technical Service" and the Patman Law, has caught up with me on an extended Eastern trip at Baltimore. One thought we probably all have on the subject of Technical Service is that it is unsatisfactory and ineffective to attempt to regulate all human relations by law. Society and law have not reached a point where we can control all actions of individuals, nor should we wish to do so. A crime against Nature is obvious and generally recognized, but there has been too great a tendency to pass laws and regulations making a crime of this or that action which is not considered improper by a large group of people. Then we have the contempt for and evasion of the law we experienced with prohibition and N. R. A.

The so-called chiseller can and will evade the law and the fair and honest business man suffers from

its restrictions and is often forced, unwillingly, to subterfuges.

I have a small business and big business or unfair business have not bothered me. As between big business and small business, each has advantages which enables it to succeed, and disadvantages which leave plenty of room for the other. And unfair business results in its own destruction.

Attempts to regulate and standardize business, which is conducted fairly and honestly, in order to reach a few outlaws will result in greater evils than those it is proposed to suppress.

R. J. Quinn
Considers Technical Service Essential

IF all the opinions and discussions that have been published regarding the Robinson-Patman Act were laid end to end, it would undoubtedly discourage many other commentators regarding other pleasant horizontal lineal pastimes.

There will be conflicting opinions and uncertainty until the Act is clarified by actual test in court. This will take time and, in the meantime, those who are sincerely anxious to comply with the provisions of the Act will keep their fingers crossed and hope that they are conducting their businesses without violation of the law.

As Congressman Wright Patman, co-author of the Act, has explained, the avowed purpose of the Act was to prevent chain stores and other large buyers from securing undue purchasing advantages over their smaller competitors. It was not designed to hamper private business or its ability to earn profits. It does, however, present a form of anti-monopoly legislation which seems certain to endure in one form or another.

The present discussion only concerns the possible effects of the Robinson-Patman Act on technical service. All branches of competitive business have found by experience that to be successful they must introduce a very definite element of service into their business. There are as many kinds of service as there are kinds of business, consequently technical service is a logical and essential element of any technical business. Surely the chemical business is a technical business, consequently technical service is a fundamental part of it, and if our new law is not intended to hamper private business, it will recognize the fact that without constructive technical service, intelligently applied, the chemical industry cannot develop and prosper.

Assuming, therefore, that technical service, *per se*, does not conflict with the law, it is only necessary to prevent unlawful discrimination in favor of any customer by furnishing services or facilities connected with the processing, handling or sale of a commodity upon terms not accorded to all purchasers on proportionately equal terms.

Technical service is generally administered on a cold-blooded business basis in proportion to the value of the business involved. An investment for technical service must pay the same return as an investment in any other phase of a company's business. When it fails to do so, it does not survive. Technical service is offered to all buyers or prospective buyers of technical merchandise. It is one of the favorite selling arguments of technical salesmen. It is featured in trade journals and direct mail advertising. Any intelligent buyer cannot fail to secure the amount of technical service to which his purchases are entitled. If the logical service is not forthcoming, the source of supply is usually changed.

Technical service is sometimes administered in unprofitable and unfortunate overdoses by the seller, but there is no law to protect the seller against such losses. A typical example is that of a pulp mill which decided to install equipment for bleaching its production. Five different manufacturers of liquid chlorine undertook to design an installation and to recommend a process for the desired purpose. Each spent in engineering and chemical service from two to five thousand dollars, and only one of the bidders received business to compensate him for his efforts. Did the other four contestants violate the law in giving valuable advice and service even though it was not used or paid for? Likewise, how much technical or any other kind of service does a buyer receive who wants half a barrel of soda ash delivered to his kitchen work shop on the fourth floor of a building not equipped with an elevator? He gets it, in "proportionately equal terms."

Personally, I do not view with alarm the Robinson-Patman Act as an influence on present practices in the application of technical service. The practices now in vogue in the chemical industry are essential, economically sound, and are neither unlawful or discriminating.

Like all commentators on this subject, this is only my opinion, based on my best judgment of the facts, and is subject to change without notice or obligation.

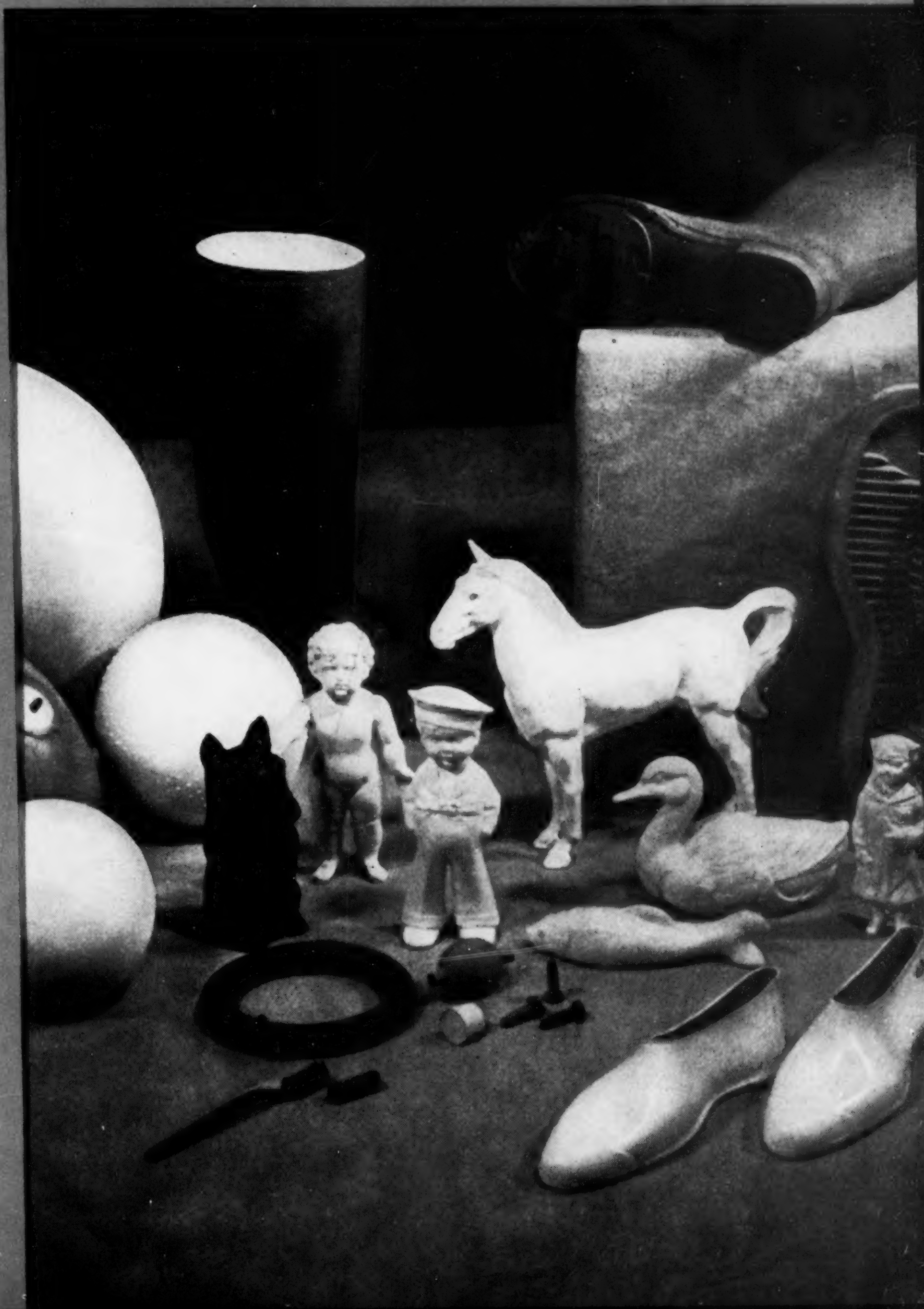
Table of Marketed Production of Liquefied Petroleum Gases by Uses and Methods of Transportation 1934 and 1935

(Thousands of gallons)

	Propane	*Butane*	*Pentane and propane-butane mixtures*	*Total* 1935	*Per cent.* 1935	*Total* [1] 1934	*Per cent.* [1] 1934
By uses:							
Domestic	18,325	1,353	1,702	21,380	27.8	17,681	31.3
Gas manufacturing	702	5,042	1,837	7,581	9.9	6,298	11.2
Industrial and miscellaneous	15,628	27,689	4,577	47,894	62.3	32,448	57.5
Total 1935	34,655	34,084	8,116	76,855	100.0	56,427	100.0
Per cent. 1935	45.1	44.3	10.6	100.0	....	100.0	....
By methods of transportation:							
Cylinders or drums	13,420	279	1,699	15,398	20.0	15,379	27.3
Tank cars, tank wagons and pipe lines	21,235	33,805	6,417	61,457	80.0	41,048	72.7
Total 1935	34,655	34,084	8,116	76,855	100.0	56,427	100.0

New Products and Processes

A Digest of Chemical Uses and U.S. Patents



Rubber articles produced by the Kaysam method, a coating process for the manufacture of rubber products from latex.

The Metallic Soaps

Their Manufacture and Uses

By H. S. Land, B.Sc.

Hardman and Holden, Ltd.

DURING recent years considerable attention has been given to the production, properties and application of the water-insoluble metallic soaps, and various methods have been employed for their production and to give products of considerable variety. Most of this work has been of an industrial character, and very little pure research has been published. The term "metallic soap" is not a good one, and the word "metallate" has been suggested instead.

The first method employed for the production of these materials might be termed the "fusion" method. This consists of heating together, at an elevated temperature, a mixture of the fatty acid with the oxide, carbonate or hydroxide of the metal required. Sometimes an easily decomposed salt of the metal is used; *e.g.*, acetate, borate, oxalate, etc.; while the fatty acid may be replaced by a naturally occurring glyceride such as linseed oil.

The second method may be termed the "extraction" method. It consists of agitating together a fatty acid with an aqueous solution of a water-soluble salt of the required metal. This salt must of necessity be one of a weak acid such as acetic acid (*e.g.*, lead acetate solution and naphthenic acid).

The third method is that of "double decomposition"; *i. e.*, the soluble sodium salt of the fatty acid is mixed with a soluble salt of the metal required (*e.g.*, sodium linoleate and cobalt sulfate).

The fusion method is probably the oldest method, but is falling into disuse. Making metallic salts by this method consists of heating fatty acids or their glycerides with the oxide or hydroxide of the required metal to a temperature of 180-300° C., depending on the individual reaction. In this reaction water is evolved, and the oxide dissolves and combines with the fatty acid.

On an industrial scale it is necessary to have good agitation, or otherwise the metallic oxide will settle to the bottom of the containing vessel, and overheating will occur at this point. Again, troublesome foaming very often occurs and the danger of fire is very real.

Another difficulty is that the solid oxide is apt to ball together, and as a result speed of solution becomes very slow. Again, this method is very restricted in its use by the chemical properties of the materials employed. In some cases a very ready reaction takes place; *e.g.*, between litharge and rosin. In other cases, such as that of cobalt oxide and linseed oil, the reaction is very slow and high temperatures are needed. In still other cases, as with chromium oxide and linseed oil, no useful result occurs.

The fusion reaction usually works better with free acids than with glycerides, while hydroxides work better than do oxides. These fused products if not heated to a suitable temperature, or if not allowed to react for a sufficient length of time, will invariably contain unchanged metallic oxide.

The "extraction method" is very limited in its application, as it necessitates the use of free fatty acids and the water-soluble salt of some weak acid; *e.g.*, naphthenic acid with lead-acetate solution. In this reaction a state of equilibrium, in which the oily layer consists of free naphthenic acid and lead naphthenate, and the aqueous layer of lead acetate and free acetic acid, is reached. Here, again, it is not practicable to obtain compounds containing the maximum amount of combined metal.

The double decomposition method is the one most extensively adopted for producing metallic soaps. This method is very adaptable and capable of giving products of great variety. By this means soaps containing any percentage of metal up to the maximum possible can be made by varying the amount of caustic soda used in saponifying the oil or acid employed. If less than the theoretical amount of caustic required be employed, the final product will contain free acid or oil. The precipitated products obtained by this method are washed with water and then dried.

Although the production of metallic soaps by this process appears comparatively simple, in actual practice the technique to be adopted may be complex. A brief consideration of the different physical types of soaps will illustrate the impossibility of manipulating all these materials in the same manner. Some of the products are liquid, others semi-liquid, others are finely divided solids; while most difficult of all to handle are the semi-solids, which entrain their mother liquor and give endless trouble in manipulation.

The liquid and semi-liquid products are not too difficult to deal with, as they may be agitated with water, but troubles do arise since some of these products are heavier than water, some are lighter and some have approximately the same density as water. Those metallic soaps which are finely divided solids have to be filtered, and are inclined to choke filtering media. If this drawback is obviated by making the product easier to filter, the material is probably found far too coarse, and grinding and sieving problems arise. Drying also presents difficulties, and temperatures have to be controlled to prevent decomposition and spoiling of the color.

For all practical purposes the metallic soaps are insoluble in water, and, usually, insoluble in alcohol and ether. They differ considerably in their behavior towards hydrocarbons, some being soluble, others being very insoluble, while others form soap-like gels. Many are soluble in the fixed oils, but generally better solubility is obtained in the corresponding fatty acids. Towards heat they are usually fairly stable, although fusion may occur. As the combination of metal and acid is almost invariably of a weak character, they are readily decomposed by strong acids or alkalis. The color of these products is usually characteristic of the metal present—*i.e.*, cobalt soaps are violet; manganese, brown; iron, dark brown; lead and zinc, yellow; nickel and chromium, green.

Where the acid used is derived from a drying or semi-drying oil, the metallic soaps made will rapidly absorb oxygen, and spontaneous combustion becomes a possibility under suitable conditions.

Aluminum stearate is a fine white powder of somewhat indefinite melting-point. The usual commercial product contains about 10 per cent. aluminum oxide. This material is made from commercial stearine, which is a mixture of palmitic and stearic acids, so that actually it is a mixture of aluminum palmitate and aluminum stearate. The tri-stearate or tri-palmitate do not exist, owing to the weak basicity of aluminum. Actually, the mono- and di-stearates are formed, and the relative amounts of these and the presence of free acid influences the properties of the material.

On heating with hydrocarbon oils, aluminum stearate swells and forms a gel; *e.g.*, with white spirit; and this swelling occurs to some extent in the cold. This property is made use of for producing greases and for oil-thickening. Aluminum stearate is also used for producing matt and semi-matt finishes, and as a disperser for pigments; *e.g.*, preventing pigments from settling. It finds use also, when dissolved in hydrocarbons, for water-proofing fabrics.

Zinc stearate is a fine white powder containing about 15 per cent. zinc oxide. Its feel is similar to that of French chalk,

* Paper (abridged) read to the Chemical Section of the Manchester Literary and Philosophical Society on October 23.

a property which has promoted its use as a dusting powder in the rubber trade, in which use, incidentally, it assists the action of vulcanization accelerators owing to its zinc content.

Zinc stearate is also used for cosmetics, both in powder and in face creams. It has the property of making face powder adhere better, and helps to make it water-resistant. It is also employed in the cellulose lacquer industry for "matting" purposes. It is soluble in benzol, toluol, xylol, etc., a property in which it differs from aluminum stearate, while its matting effects are more permanent than those of aluminum stearate.

Magnesium stearate finds similar applications to zinc stearate, but chiefly in the cosmetic trades. It contains 7 per cent. magnesium oxide. Calcium stearate contains 8 per cent. calcium oxide. It is used in the grease trade and in polishing metals; *e.g.*, chromium plating.

A true cobalt linoleate containing no free linseed oil has a maximum content of about 9.5 per cent. metal. This is a sticky solid and very inconvenient to handle. In practice it is sold as 6 per cent., 5 per cent., or 4 per cent. cobalt metal, by reducing to these amounts with linseed oil. In this form it is a reddish violet liquid, perfectly stable in the absence of air, but readily skinning in the presence of air, due to oxidation. It is miscible with hydrocarbon and most vegetable oils in all proportions, and it is this property which makes it of such great value as a "drier" for drying and semi-drying oils. On oxidation it first assumes a green color, but this eventually disappears. Cobalt linoleate is the most powerful drier known to the paint and similar trades, where its properties are taken advantage of particularly with light-colored pigments. There are two types of linoleate on the market, fused and precipitated.

Manganese linoleate is a dark brown solid containing 9.5 per cent. manganese, which is usually reduced with oil to 6 or 4 per cent. to facilitate handling.

Lead linoleate contains a maximum of 29 per cent. lead, and is a solid, while products with low contents of lead are cloudy liquids. It is used as a drier, but has many drawbacks in this application. Solutions in hydrocarbons and other oils are unstable, lead stearate and other insoluble lead salts being formed. Usually, fused lead linoleate is more soluble in fixed oils than is the precipitated product.

All linoleates suffer from a great disadvantage in that they are very susceptible to oxidation with the formation of insoluble materials. Stearates do not suffer from this objection, but have very poor solubility, as gels are formed. Oleates are intermediate in their properties, between linoleates and stearates, but have the disadvantages of both.

Commercial naphthenic acid is a mixture of carboxylic acids obtained as a by-product in the purification of petroleum oils. Naphthenic acid is a brown liquid of acid value 240 to 270, and consists mainly of carboxylic acids of cyclo-pentane derivatives. Naphthenates have attracted considerable attention for three reasons: (*a*) It is possible by their use to obtain a high percentage of combined metal; (*b*) highly concentrated solutions may be made in hydrocarbon oils; (*c*) they are only very slightly susceptible to oxidation.

Cobalt naphthenate is a deep violet colored solid containing 12 per cent. cobalt, and is readily soluble in hydrocarbon oils and fatty acids. It is not so soluble in neutral fixed oils. It is a very useful and powerful "drier," particularly for paints and varnishes which are light in color. As its action is mainly as a surface drier, it is usually combined with some other metal which will promote hardening of the paint or varnish film; *e.g.*, lead or zinc.

Manganese naphthenate is a deep-brown colored solid containing 11 to 12 per cent. manganese. It is used as a drier, and dissolves in hydrocarbons to give a brown solution. Lead naphthenate is a sticky solid containing 32 per cent. lead. It dissolves in hydrocarbons to give a yellow solution, and is also mainly used as a drier.

Zinc naphthenate contains 12 to 13 per cent. zinc, and is similar to lead naphthenate in appearance. Alone, it is of very little use as a drier, but when combined with cobalt or manganese it is of great value for hardening the paint or varnish film.

Zinc naphthenate has some other interesting properties. It is well known that certain pigments when incorporated in a paint tend to inhibit the action of the driers used, carbon black being a case in point, but the presence of zinc naphthenate prevents this undesirable result. It is also useful, in a similar manner, where some of the synthetic resins tend to inhibit drying. Recent work carried out in the United States indicates that its presence facilitates the wetting and grinding of certain pigments. It is a very good fungicide and prevents mold growth, a fact which is being applied to the manufacture of water paints and distempers, and to the rot-proofing of textile materials.

Copper naphthenate is a deep-green solid containing 12 to 13 per cent. copper. It is a very powerful fungicide, and is of great value for rot-proofing and for the prevention of mildew. Timber or fabric treated with a solution in naphtha of this material is very resistant to attack by mildew and insects. Wood so treated may be painted over without the objectionable brown stains occurring which are a feature when creosote is used in this way.

Aluminum naphthenate contains 4½ per cent. aluminum, and is a yellow-brown rubbery solid. It is of little value as a drier, but when dissolved in oils, even in small quantities, it enormously increases their viscosity. It has found use in paints and varnishes for undercoats and as a "suspender" for pigments. It has good water-repellent properties.

Other naphthenates have been prepared and find special if somewhat restricted uses. In all cases of solutions of metallic naphthenates the viscosity may be considerably reduced by the addition of small amounts of alcohols; *e. g.*, butanol. Abstracted from *The Chemical Trade Journal.*

Miscellaneous

A uniform, constant source of supply of pitch is offered, for the first time in history, to all industries using it as a basis for their products. There are various kinds (*e. g.*, animal, vegetable, and a composite of waste products) and types of pitch (*e. g.*, unyielding compounds adaptable to possibly one product) on the market, but this new product developed by A. E. Starkie Co., Chicago, Illinois, is the only one of its kind adaptable to all industries and having any melting point and color.

Triples Life of Silk Stockings

Tuxite, a preparation which triples the life of silk stockings, is a specially prepared iron-free aluminum sulfate.

Waterproof Matches from Synthetic Resins

Synthetic resin as the binder for the inflammable composition of match heads is being employed in the Swedish match industry. Composition is made with a suitable proportion of a synthetic resin of the hardenable type, heads are applied to the sticks, and the resinous binder is hardened. *British Plastics,* October 1936, p. 220.

Bonding Resin for Veneers and Plywood

Catabond, a synthetic resin, especially developed to replace certain types of glues in the production of superior grades of plywood and other laminated products, is announced by American Catalin Corp., New York City.

Mercuric Chloride for Timber Preservation

In a paper read before the International Congress of Mines, Metallurgy, and Applied Geology, Dr. C. Stauch, Director-General of the Czecho-Slovakian State Mines and Forges, dealt

with the use, in shafts and roadways, of timber treated by injection with mercuric chloride preparations. Treated timber possesses a resistance to decay four times greater than that of untreated timber.

Chemical Seed Germinating Process

A process alleged to artificially stimulate seed germination for the purpose of providing an easily digested animal fodder in a minimum of time and at very low cost is reported by Trade Commissioner R. M. Stephenson, Berlin. Seeds and shoots are immersed twice a day for one hour in a chemical salt solution. Merits of the process have not been investigated.

Zinc Acetate for Weighting Silks

Use of zinc acetate allows the weighting of silk to be increased considerably, and several processes involving use of this product are described in *Textile Colorist,* p. 758, having been abstracted from *Textile Manufacturer.*

Disintegration of the Atom

An electrostatic generator, which is designed to attain d. c. potentials of five million volts or more above ground potential, is now under construction at the Westinghouse Research Laboratories. Attainment of such steady voltages above ground will enable scientists to secure fundamental information in this relatively unexplored field of steady voltages. Westinghouse scientists plan to use this generator in investigations of nuclear reactions throughout the region of available voltages.

Anti-Crease Methods

Notes on the Tootal anti-crease process and other attempts to solve the problem of crushing are given by R. P. Jackson in *The Dyer & Textile Printer,* October 23, p. 409.

Pine Oil as Vegetable Oil Denaturant

Steam-distilled pine oil has been added to the list of substances authorized for use as denaturants for vegetable oils under Bureau of Customs' regulations. The ruling calls for addition of 100 fluid ounces of the material to each 100 gallons of the vegetable oil to be denatured.

New Plywood

Xylotekt, plywood reinforced with asbestos-cement on the outside or between the plys, is being manufactured by Plybestos, Ltd., new British company. *Chemical Age,* June 13.

Electro-deposition of Molybdenum

Steel grey deposits of molybdenum may be obtained from a solution prepared by the electrolytic reduction of molybdic acid anhydride dissolved in sulfuric acid (1.450 sp. gr.) using platinum electrodes, the ratio of molybdic acid to sulfuric acid being 2 gr. to 5 cc. and reducing until 4 amp.-hr. of current per gram has passed through the solution. The best conditions for plating are a current density of 36 amp./dm.^{2} and a temperature of 50-55° C. These results were reported by Prof. W. O. Brown and W. P. Price, of Indiana University, to a recent meeting of the American Electrochemical Society. They further report that no addition agent was found that would aid in obtaining bright deposits of molybdenum or in the formation of the plating baths.

Phenol-Furfural Plastics

Maizolith, a plastic similar to the phenol-formaldehyde type, can be made from phenol and furfural, according to L. K. Arnold, Iowa Engineering Experiment Station, Iowa State College. It can be molded into any desired shape and used instead of hard rubber and similar products for a wide variety of uses. The phenol-furfural condensation product, free from filler, can be used as a varnish.

Cuts Anaesthetic Costs

Synthesis of the anaesthetic, cyclopropane, from the plentiful propane occurring in natural gas and crude petroleum was reported to the organic division of the A. C. S. by chemists of Purdue University. New process will allow wide adoption by cutting costs materially. By-products of process consist of hydrochloric acid and propylene chloride, and of 1, 1-dichloropropane and 2, 2-dichloropropane, which are industrially new.

Fused Wood Pulp Plastics

Barkalait, an inexpensive plastic product called "fused wood pulp," is being made in Russia from sawdust or, better still, from straw. Valuable plastics are made by blending it with Bakelite; and still other useful plastics are formed by condensing it with amino compounds. (T. Iv. and O. B. Iv. *Journal of Applied Chemistry* (U. S. S. R.), Vol. 9, pp. 322-334.)

Caustic Resistant Paints

Causticbond, an alkali-resistant paint, and Acidbond, an acid-resistant paint, recommended for use in tanks, pipes, vats, and other containers carrying liquids of high alkali or normal acid concentration, are being introduced by the Wilbur & Williams Co., Boston.

Rubber-Containing Paints

A rubber-containing enamel, recommended for woodwork, ceilings, and walls, which works freely under the brush, flows perfectly, and leaves no brush marks, is reported on the market by The Rubber Growers' Ass'n.

Cow Disease Curbed by Hotis Test

The Hotis Test for mastitis, costly disease of dairy cattle, is the U. S. Dept. of Agriculture's latest research achievement, reports *Science Service.* Test is performed by adding bromcresol-purple dye to a sample of milk and incubating mixture for 24 hours.

Activated Carbon Paints

Activated carbon paints on German market give promise of being satisfactory for metal protection coatings and are expected to reduce consumption of pigments containing lead, nearly all of which are imported, a report from Frankfort-on-Main states.

Control of Bark Beetles

Entomologists of the U. S. Dept. of Agriculture have worked out promising methods for introducing into the sap stream of a tree infested with bark beetles chemicals poisonous to the insects. The rising sap carries these chemicals—zinc chloride and copper sulfate—all through the tree, impregnating the tissues much more simply and at far less cost than could be done with an outside force.

Nitrogenous Fertilizers on Rubber Plantations

A report by Dr. W. B. Haines, of Dunlop Plantations, Ltd., and E. Guest, on the use of nitrogenous fertilizers on rubber plantations is given in the October issue of the *"Empire Journal of Experimental Agriculture."*

Month's New Dyes

General Dyestuff announces Rapidogen Red Violet RR, an easily soluble Rapidogen brand, producing red violet shades of good fastness to light and very good fastness to washing and chlorine. Indanthren Olive Green B A Paste, a homogeneous vat dyestuff recommended for the dyeing of cotton and rayon in its various forms. General Aniline releases through General Dyestuff, Katigen Brown Ron Conc., a new sulfur dyestuff which produces on cotton and rayon bright shades of a full brown of good all around fastness.

The Dyestuffs Division, du Pont, announces the first American production of "Monastral" Fast Blue BS.

U. S. Chemical Patents

A Complete Check—List of Products, Chemicals, Process Industries

Agricultural Chemicals

Production of fertilizer by the reaction of aqua ammonia and monocalcium acid phosphate containing material. No. 2,060,310. Edward William Harvey, Highland Park, N. J., to The Barrett Co., N. Y. City.

Production of a granular fertilizer containing ammonium chloride and an alkaline earth or magnesium carbonate. No. 2,061,534. Otto Balz, Adolf Leber, and Heinrich Dieckmann, Ludwigshafen-on-the-Rhine, Ger., to I. G. Frankfort, Ger.

Cellulose and Derivatives

Treatment of organic cellulose derivative filaments with an organic shrinking agent to increase their dry extensibility. No. 2,058,422. William Alexander Dickie and Percy Frederick Combe Sowter, Spondon, near Derby, Eng. to Celanese Corp. of America, Del.

Saponification of filaments of organic ester of cellulose by treatment with an alkaline saponifying medium containing oil. No. 2,058,574. Henry Dreyfus, London, Eng.

Process for manufacture of filaments from elastin-containing or collagenous animal fibrous materials. No. 2,058,835. Wilhelm Schulte to N. V. Koninklijke Pharmaceutische Fabrieken v/h Brocades-Stheeman & Pharmacia, all of Meppel, Netherlands.

Apparatus for digesting cellulose. No. 2,059,149. Friedrich Wilhelm Ludwig Schilde, Graz, Austria.

Solution of organic cellulose containing in addition to usual volatile solvent, a higher boiling solvent equivalent to at least 16% of the cellulose derivative present. No. 2,059,322. Henry Dreyfus, London, Eng.

Production of filaments of organic derivatives of cellulose which may be delustered by scouring by the addition of sugars and their metal compounds to the cellulose solutions. No. 2,059,425. William Whitehead, Cumberland, Md., to Celanese Corp. of America, Del.

Method of removing aldehydic impurities from benzyl cellulose. No. 2,059,619. David Traill, Ardrossan, Scotland, to Imperial Chemical Industries Ltd., Gt. Brit.

Process of treating organic esters of cellulose. No. 2,059,934. Alma Dobry to Compagnie de Produits Chimiques et Electrometallurgiques, Alais, Froges et Camargue, both of Paris, France.

Artificial filament manufacture. No. 2,060,048. Henry Dreyfus, London, Eng.

Manufacture of cellulose from lignocellulosic materials by extracting the lignin with organic solvents containing sulfur dioxide. No. 2,060,068. Walter Henry Groombridge and Eric Vernon Mellers, Spondon, Derby, Eng., to Celanese Corp. of America, Del.

Coal Tar Chemicals

Method of dehydrating pyridine and its alkyl homologues. No. 2,058,435. Webster E. Fisher, Rochester, N. Y. to Eastman Kodak Co. Jersey City, N. J.

Purification of naphthylamine sulfonic acid. No. 2,058,911. Herbert V. Rapp, Buffalo, N. Y. to National Aniline & Chemical Co., N. Y. City.

Recovery of carboxylic acids from oxidation products of non-aromatic hydrocarbons. No. 2,059,232. Max Harder, Oppau, Ger., to I. G., Frankfort, Ger.

Compounds of the benzanthrone series. No. 2,059,646 and No. 2,059,647. Melvin A. Perkins, Milwaukee, Wis., to du Pont, Wilmington, Del.

4-amino-dinitro-diphenylamines. No. 2,059,800. Leopold Laska and Rudolf Heil, Offenbach-on-the-Main, Ger., to General Aniline Wks., N. Y. City.

Recovery of phenol from aqueous liquors containing emulsion-forming substances. No. 2,060,230. Fritz Luttge, Leuna, to I. G., Frankfort, Ger.

Nitro-phenyl-arylene-thiazyl-disulfides. No. 2,060,428. Winfield Scott, Nitro, W. Va., to Monsanto Chemical Co., St. Louis, Mo.

Alkyl chloro-resorcinols. No. 2,060,654. William E. Austin, N. Y. City, to Bank of The Manhattan Co.

N-ethyl, n-ethylol cresidine. No. 2,060,845. Alfred William Baldwin, Blackley, Reginald William Everatt, Heysham, and Arthur Howard Knight, Blackley, Eng., to Imperial Chemical Industries Ltd., Gt. Brit.

Manufacture of oil soluble phenols. No. 2,060,965. Charles P. Wilson, Jr., Houston, Tex.

Unsymmetrical fluoro-phenyl-thioureas. No. 2,061,243. Herbert A. Lubs and Arthur L. Fox to du Pont, both of Wilmington, Del.

Process of halogenating n-dihydro-1:2:2':1'-anthraquinone azines. No. 2,061,249. Ferdinand W. Peck, Penns Grove, N. J., and Raymond J. Sobatski, Carrollville, Wis., to du Pont, Wilmington, Del.

Coatings

Thin, flexible, transparent wrapper of regenerated cellulose for protection of articles from deteriorating effects of actinic light. No. 2,058,786. Dudley H. Grant, Berkeley Heights, N. J., to Stanco Inc., Del.

Nitrocellulose bronzing liquid containing an alkali metal salt of citric acid to prevent gel formation. No. 2,059,310. Charles Bogin, Terre Haute, Ind., and Vaughn Kelly, Chicago, to Commercial Solvents Corp., Terre Haute, Ind.

Wire insulation containing cellulose ester and furfural residue resin. No. 2,059,441. Edward H. Converse, Poughkeepsie, N. Y. to Case, Pomeroy & Co., N. Y. City.

Paint or varnish with a glycerol-phthalate base. No. 2,059,791. Paul M. Hennegan, Cincinnati, Ohio, and Raymond A. Swain, Bellevue, Ky., said Swain to said Hennegan.

Oil lacquer. No. 2,059,815. Walther Schrauth, Berlin-Dahlem, Ger., to "Unichem" Chemikalien Handels A.-G., Zurich, Switz.

Coating compositions. No. 2,059,948. Harold S. Holt to du Pont, both of Wilmington, Del.

Crystallizing lacquer containing nitrocellulose, a crystallizable organic carboxylic acid and a free fatty acid of a glyceride oil. No. 2,059,981. Theodore F. Bradley, Westfield, N. J., to Ellis-Foster Co., N. J.

Manufacture of sheet material by sealing printed tissue paper to "Japanese" tissue with liquid rubber. No 2,060,041. Elbert A. Corbin, Jr., Gradyville, and Ellwood W. Wolf, Philadelphia, one-third to William C. Biddle, Lansdowne, Pa.

Roofing material consisting of a base, and a mixture of oil, synthetic resin and large particles of mineral matter. No. 2,060,083. Robert T. Johnston, Plainfield, N. J., to Bakelite Corp., N. Y. City.

Coating for wood consisting of a phenolic resin composition covered with an oil-phenol resin composition. No. 2,060,084. Robert T. Johnston, Plainfield, N. J., to Bakelite Corp., N. Y. City.

Coating composition of rubber latex, water-soluble glue, glycerine and a water-immiscible rubber solvent. Milton O. Schur to Brown Co., both of Berlin, N. H.

Oil varnishes having a resinous conversion product of rubber as a base. No. 2,060,412. Wilhelm Breuers and Hermann Schatz, Ludwigshafen, Ger., to I. G., Frankfort, Ger.

Food and beer can lacquers consisting of a vinyl resin varnish containing a trace of phosphoric acid. No. 2,060,572. Adolf Heck to Cook Paint and Varnish Co., both of Kansas City, Mo.

Lacquer containing an alcohol-soluble phenol-aldehyde resin and a metal oxide from the group consisting of red lead and cadmium oxide. No. 2,060,625. Georg Kranzlein, Frankfort-on-the-Main-Hoechst, and Richard Karl Muller, Bad Soden, Ger., to I. G., Frankfort, Ger.

Sanitary hardened organic paint-like coating for steel building structure. No. 2,060,655. Thomas V. Balch, Shaker Heights, to The E. F. Hauserman Co., Cleveland, Ohio.

Process for laminating and coating with synthetic resins. No. 2,061,203. Ericsson H. Merritt, Lockport, N. Y., to Laminating Patents Corp., Seattle, Wash.

Coating process. No. 2,061,338. Julian P. Ward, to The General Coating Co., both of Cleveland.

Preparation of transparent moistureproof material. No. 2,061,374. William Hale Charch, Buffalo, N. Y., to du Pont, Wilmington, Del.

Electrical insulation composed of a layer of rubber covered with a bonding coating of a nitrocellulose base and a plasticizer which in turn is covered with a cellulose acetate coating. No. 2,061,528. Elmer W. Trolander and William Courtney Wilson to Pyroxylin Products, all of Chicago.

Dyes, Stains, etc.

Preparation of carbocyanine dyes. No. 2,058,406. Leslie G. S. Brooker and Frank L. White, Rochester, N. Y., to Eastman Kodak Co., Jersey City, N. J.

Dyeing and printing compositions comprising an ice color coupling component and a diazoimino compound. No. 2,058,418. Miles A. Dahlen, Stanley R. Detrick, Robert E. Etzelmiller, and Frithjof Zwilgmeyer, to du Pont, all of Wilmington, Del.

Diazoimino compounds and their production. No. 2,058,419. Miles A. Dahlen, Stanley R. Detrick, Robert E. Etzelmiller, and Frithjof Zwilgmeyer, to du Pont, all of Wilmington, Del.

Dyeing composition containing two acetate artificial silk amino azo dyestuffs, one of which has a poor affinity for acetate silk. No. 2,058,433. Friedrick Felix, Basel, Max Bommer, Riehen, near Basel, and Wilhelm Huber, Basel, Switzerland, to Society of Chemical Industry in Basle, Basel, Switzerland.

Dibenzanthrones. No. 2,058,477. William Hiram Lycan, South Milwaukee, Wis., to du Pont, Wilmington, Del.

Dye powder composition comprising a water insoluble dyestuff, colloidal solubilized modification of starch and a wetting agent. No. 2,058,489. Wilfred M. Murch, Hamburg, and Frances M. Higgins, Buffalo, N. Y. to National Aniline and Chemical Co., N. Y. City.

Compounds of the violanthrone series. No. 2,058,606. William Hiram Lycan to du Pont, both of Wilmington, Del.

Compounds of the violanthrone series. No. 2,058,607. William Hiram Lycan, South Milwaukee, Wis. to du Pont, Wilmington, Del.

Preparation of water-insoluble azine dyestuffs of the induline series by heating nitro-benzene with an alkoxy-substituted amine of the benzene series. No. 2,058,666. Achille Conzetti to J. R. Geigy A. G., both of Basel, Switzerland.

Method of pigmenting cellulose ester solutions by dry grinding the pigment with dry cellulose organic acid ester before adding to the cellulose ester. No. 2,059,088. Henry R. Childs, Kingsport, Tenn., to Eastman Kodak Co., Jersey City, N. J.

Azo dyestuffs. No. 2,059,094. Bernd Eistert, Mannheim, and Hans Drzikalla and Guido van Rosenberg, Ludwigshafen-on-the-Rhine, Ger., to General Aniline Wks., N. Y. City.

Dyestuffs of the anthraquinone series. No. 2,059,476. Paul Nawiasky, Ludwigshafen-on-the-Rhine, Berthold Stein, Mannheim, and Robert Zell, Ludwigshafen-on-the-Rhine, Ger. to General Aniline Wks., N. Y. City.

Monoazodyestuffs. No. 2,059,512. Richard Fleischauer, Frankfort-on-the-Main-Fechenheim, Ger. to General Aniline Wks., N. Y. City.

Production of sulfur dyes from nitrophenols, alkali metal sulfides and alkali metal polysulfides. No. 2,059,579. Raymond W. Hess, Buffalo, N. Y. to National Aniline & Chemical Co., N. Y. City.

Azo dyes. No. 2,059,852. Miles Augustinus Dahlen and Frithjof Zwilgmeyer, to du Pont, all of Wilmington, Del.

Patents digested include issues of the "Patent Gazette," October 27 through November 17 inclusive.

Water insoluble azo dyestuffs. No. 2,059,903. Pierre Petitcolas, Rouen, France, to Compagnie Nationale de Matieres Colorantes et Mfg. de Produits Chimiques du Nord Reunies, Etablissements Kuhlmann, Paris, Fr.
Azo dyestuffs. No. 2,060,163. Gerald Bonhote to Society of Chemical Industry in Basle, both of Basel, Switz.
Metalliferous hydroxyazo dyes. No. 2,060,381. Hermann Schladebach, and Herbert Hahle, both of Dessau-Ziebigk in Anhalt, Ger., to General Aniline Wks., N. Y. City.
Trimethine-cyanine dyes. No. 2,060,382. Wilhelm Schneider, Dessau an Anhalt, Ger., to Agfa Ansco Corp., Binghamton, N. Y.
Azo dyestuffs containing chromium. No. 2,060,563. Erich Fischer, Bad Soden-on-the-Taunus, Ger., to General Aniline Wks., N. Y. City.
Azo dyestuffs. No. 2,061,104. Hans Roos, Leverkusen-K. G.-Werk, Ger., to General Aniline Wks., N. Y. City.
Water-soluble azo dyestuffs. No. 2,061,126. Karl Zahn, Kurt Schimmelschmidt and Heinrich Koch, Frankfort, Ger., to General Aniline Wks., N. Y. City.
Azo dyestuffs. No. 2,061,159. William Edward Kemmerich, Nyack, N. Y., to General Aniline Wks., N. Y. City.
Fluorine containing vat dyes. No. 2,061,186. John Elton Cole to du Pont, both of Wilmington, Del.

Explosives

Nitrosoguanidine as a priming ingredient. No. 2,060,522. Fredrich Olsen and Frederick R. Seavey, Alton, to Western Cartridge Co., East Alton, Ill.

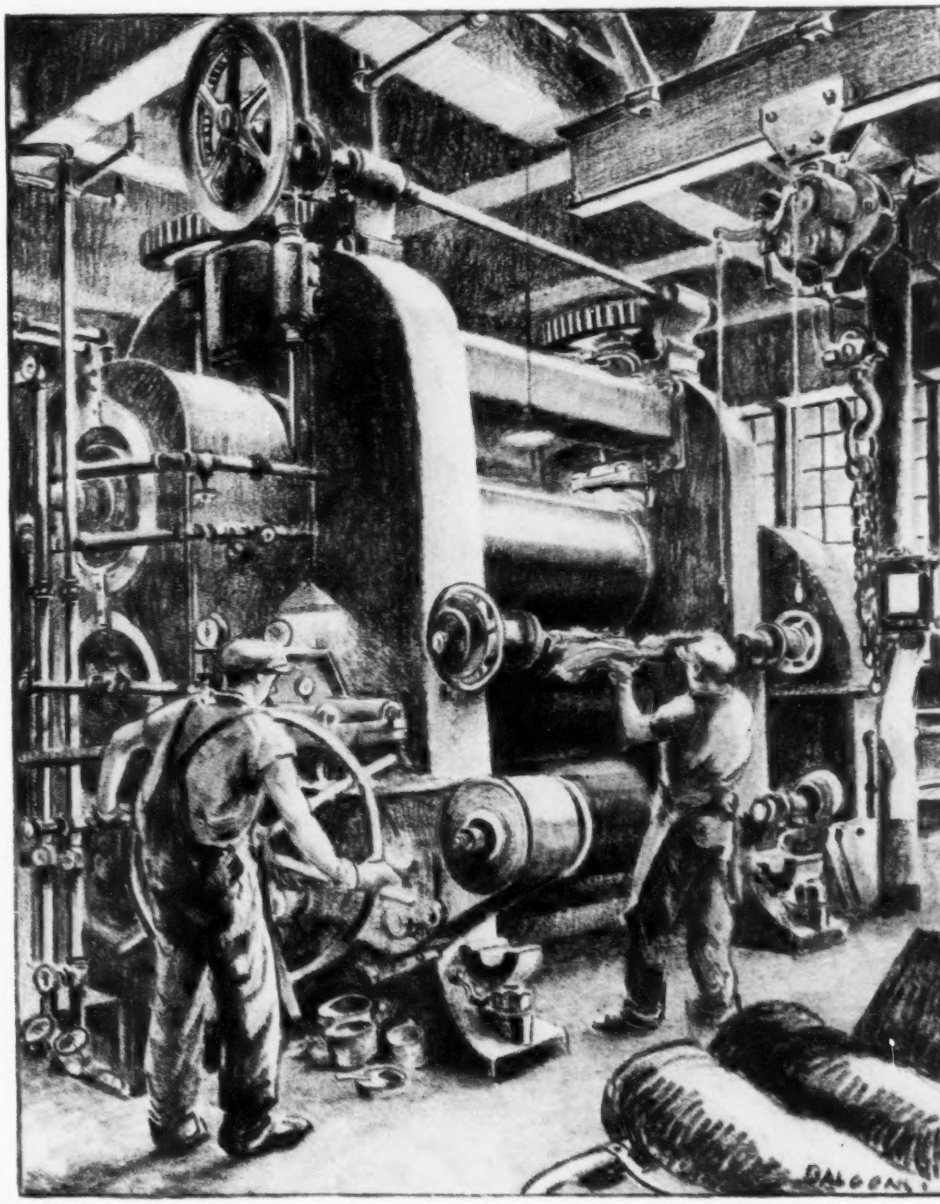
Fine Chemicals

Organic bismuth compounds of hydroaromatic endomethylene benzoic acids. No. 2,058,403. Max Bockmuhl, Walter Persch, and Gustav Ehrhart, Frankfort-on-the-Main-Hochst, Germany, to Winthrop Chemical Co., N. Y. City.
Method of improving sulfonated hydroxy aromatic compounds by use of a water soluble sulfate. No. 2,058,504. Bryan L. Rauschert, Grapeview, Wash., to National Aniline & Chemical Co., N. Y.
Ethers of morphine and its dihydrogenated derivative. No. 2,058,521. Lyndon Frederick Small, Charlottesville, Va., to U. S. Government.
Backing of photographic materials to prevent halation. No. 2,058,725. Wilhelm Schneider, Dessau in Anhalt, Ger., to Agfa Ansco Corp., Binghamton, N. Y.
Aryl mercury salts of oxyacids of chromium. No. 2,059,196. Carl N. Andersen, Watertown, Mass., to Lever Brothers Co., Me.
Aromatic imino compounds. No. 2,059,466. Otto Limpach, Wiesbaden-Biebrich, and Karl Hager, Frankfort, Ger., to General Aniline Wks., N. Y. City.
Manufacture of hydrogen peroxide. No. 2,059,569. George W. Filson, Kenmore, N. Y. and James H. Walton, Madison, Wis., one-third to William S. Pritchard, Mount Vernon, N. Y.
Manufacture of photographic silver halide developing emulsions. No. 2,059,642. Bruno Kankelwitz, Dresden, Ger.
Hardening photographic gelatin emulsions and solutions by treatment with one of the hydroxyaldehyde group up to and including the pentoses, the hydroxy dialdehydes and the hydroxyaldehyde ketones. No. 2,059,-817. Samuel E. Sheppard and Robert C. Houch, Rochester, N. Y., to Eastman Kodak Co., Jersey City, N. J.
Sensitive photographic element. No. 2,059,829. Erwin J. Ward, Rochester, N. Y., to Eastman Kodak Co., Jersey City, N. J.
Method of making a stripping photographic film. No. 2,059,843. Norman F. Beach, Rochester, N. Y., to Eastman Kodak Co., Jersey City.
Manufacture of photographic films. No. 2,059,862. Harry Le B. Gray, Rochester, N. Y., to Eastman Kodak Co., Jersey City, N. J.
Sizing photographic paper by treatment with high velocity steam and plunging it into a sizing bath. No. 2,059,880. Gerould T. Lane, Rochester, N. Y., to Eastman Kodak Co., Jersey City, N. J.
Film for color photography. No. 2,059,884. Leopold D. Mannes and Leopold Godowsky, Jr., Rochester, N. Y., to Eastman Kodak Co., Jersey City, N. J.
Differential treatment of multi-layer photographic films. No. 2,059,887. Leopold D. Mannes and Leopold Godowsky, Jr., Rochester, N. Y., to Eastman Kodak Co., Jersey City, N. J.
Photographic emulsions containing 7-alkyl-thio iso- and pseudo-cyanines. No. 2,060,023. Leslie G. S. Brooker, Rochester, N. Y., to Eastman Kodak Co., Jersey City, N. J.
Substituted amides of tertiary butyl acetic acid. No. 2,060,154. Frank C. Whitmore, State College, Pa., and August H. Homeyer, St. Louis, Mo., to Mallinckrodt Chemical Wks., St. Louis, Mo.
Alkali-metal salts of antimoniothiomalic acid. No. 2,060,181. Marcel Delepine, Paris, and Paul Gailliot, Parc St. Maur, to Societe des Usines Chimiques Rhone-Poulenc, Paris, Fr.
Sensitized silver halide emulsions. No. 2,060,383. Wilhelm Schneider, Dessau in Anhalt, Ger., to Agfa Ansco Corp., Binghamton, N. Y.
Photographic developer containing a halogenated 2-methylaminophenol. No. 2,060,594. Wilhelm Schneider, Dessau, and Gustav Wilmanns, Wolfen Dreis Bitterfeld, Ger., to Agfa Ansco Corp., Binghamton, N. Y.
Photographic developer including a 2-methylaminophenol containing in its nucleus an alkoxy group without alkali. No. 2,060,595. Wilhelm Schneider, Dessau, and Gustav Wilmanns, Wolfen Dreis Bitterfeld, Ger., to Agfa Ansco Corp., Binghamton, N. Y.
Photographic developer containing 2-methylaminophenol containing in its nucleus a radical from the amino or dialkylamino groups. No. 2,060,-596. Wilhelm Schneider, Dessau, and Gustav Wilmanns, Wolfen Dreis Bitterfeld, Ger., to Agfa Ansco Corp., Binghamton, N. Y.
Production of angelic acid by reducing beta from angelic acid with nascent hydrogen. No. 2,060,623. Hans P. Kaufmann, Munster, Ger., to Monsanto Chemical Co., St. Louis, Mo.
N-monoalkylated 5.5-disubstituted barbituric acids. No. 2,061,114. Ludwig Taub and Walter Dropp, Wuppertal-Elberfeld, Ger., to Winthrop Chemical Co., N. Y. City.
Method for the production of a photographic exposure material for color screen pictures. No. 2,061,182. Martin Zeller to Robert Rochling, both of Munich, Ger.
Solutions of bismuth salts of carboxylic acids in oils. No. 2,061,320. Friedrich Hampe and Walther Persch, Frankfort, Ger., to Winthrop Chemical Co., N. Y. City.
Cyanuryl derivatives of dithio-carbamic acids. No. 2,061,520. Ludwig Orthner, Leverkusen-I. G. Werk, and Max Bogemann, Cologne-Mulheim, Ger., to I. G., Frankfort, Ger.

Industrial Chemicals, Apparatus, etc.

Process and apparatus for fluorinating halogenated acyclic hydrocarbons. No. 2,058,453. Lee Cone Holt, Edgemoor, and Mortimer A. Youker, Wilmington, Del. and Robert F. Laird, Salem, N. J. to Kinetic Chemicals, Wilmington, Del.
Method of expelling the liquid of cashew nut shells by heat. No. 2,058,456. Edward R. Hughes, Morristown, N. J., to The Harvel Corp., N. J.
Process of adding a hydrogen halide to a compound containing an olefinic linkage using an antioxidant to obtain desired isomer. No. 2,058,465. Morris S. Kharasch, Chicago, to du Pont, Wilmington, Del.
Process of adding a hydrogen halide to a compound containing an olefinic linkage using a peroxide to obtain desired isomer. No. 2,058,-466. Morris S. Kharasch, Chicago, to du Pont, Wilmington, Del.
Production of colloidal calcium carbonate from lime and carbon dioxide in the presence of water. No. 2,058,503. Harold Robert Rafton and Arthur Minard Brooks, Andover, Mass., to Raffold Process Corp., Mass.
Process for catalytic synthesis of heterocyclic amines. No. 2,058,547. Homer Adkins, Madison, Wis., and Howard I. Cramer, Cuyahoga Falls, Ohio.
Potato starch extracting machine. No. 2,058,560. Charles K. Brandstrom, Seattle, Wash.
Method of hardening drying oils. No. 2,058,596. Walter J. Koenig, Philadelphia, Pa.
Methods of hardening drying oils. Nos. 2,058,597 and 2,058,598. Walter J. Koenig to Sloane-Blabon Corp., both of Philadelphia.
Antioxidant for vulcanized rubbers. No. 2,058,615. Harold A. Morton, Akron, Ohio.
Method of manufacture of barium fluosilicate from barium sulfide and fluosilicic acid. No. 2,058,664. Fred C. Carlson, Lakewood, Ohio, to The Grasselli Chemical Co., Cleveland.
Manufacture of starch from corn. No. 2,058,683. Robert Edman Greenfield to A. E. Staley Mfg. Co., both of Decatur, Ill.
Acidity testing unit using a vacuum tube circuit. No. 2,058,761. Arnold O. Beckman, Altadena, and Henry E. Fracker, Pasadena, Calif., to National Technical Laboratories, Pasadena.
Hydrolysis of the organic esters of inorganic acids. No. 2,058,844. Thomas H. Vaughn, Niagara Falls, to Carbide and Carbon Chemicals Corp., N. Y.
Process for sulfating mixtures of olefines. No. 2,058,851. Benjamin T. Brooks, Greenwich, Conn., to Standard Alcohol Co., Wilmington, Del.
Production of quick hydrating anhydrous dextrose. No. 2,058,852. Thomas A. Bruce, Western Springs, Ill., to International Patents Development Co., Wilmington, Del.
Production of high strength lithopone. No. 2,058,879. Leon S. Holstein, Great Neck, N. Y., to New Jersey Zinc Co., N. Y. City.
Plasticizer for glassine paper comprising glycerine, a monosaccharide and a wetting agent. No. 2,058,961. Lewis Dozier to Rhinelander Paper Co., both of Rhinelander, Wis.
Process for hydrating caustics and dehydrating hydrous salts. No. 2,058,980. Amos K. Hobby, Cambridge, and Parker C. Choate, Essex, Mass.
Machine for testing the plasticity of clay. No. 2,059,036. Davidge H. Rowland to Locke Insulator Corp., both of Baltimore, Md.
Electrolytic production of uniform, colored, protective oxidic films. No. 2,059,053. Jesse E. Stareck, Lawrence, Kans., to Kansas City Testing Lab., Kansas City, Mo.
Production of neutral esters of phosphoric acid. No. 2,059,084. Kurt Buchheim to Chemische Fabrik von Heyden, A. G., Radebeul, near Dresden, Ger.
Purification of saccharine liquors. No. 2,059,110. John P. Ioannu to Pennsylvania Salt Mfg. Co., both of Philadelphia.
Process for producing fine grained precipitates by liquid phase reactions using a spray. No. 2,059,116. Siegfried Kiesskalt, Albert Funke, and Karl Boedeker, Frankfort-on-the-Main-Hochst, Ger., to I. G., Frankfort, Ger.
Aryl mercury aromatic carboxylates No. 2,059,195. Carl N. Andersen, Watertown, Mass., to Lever Brothers Co., Me.
Recovery of fatty acids from the oxidation products of liquid phase oxidation of nonaromatic hydrocarbons. No. 2,059,201. Hans Beller, Ludwigshafen-on-the-Rhine, and Max Schellmann, Mannheim, Ger., to I. G., Frankfort, Ger.
Blown drying oil and its derivatives. No. 2,059,259. James Scott Long and George Loyal Ball, Jr., Bethlehem, Pa., said Ball to Archer-Daniels-Midland Co., one-third, and one-sixth to Lehigh University, Pa.
Reactive compounds of unsaturated oil and process of producing the same. No. 2,059,260. James Scott Long, Coopersburg, Pa., and George F. Beal, Minneapolis, Minn., to Archer-Daniels-Midland Co., Del.
Apparatus for producing a dry, fixed gas from liquid hydrocarbons. Nos. 2,059,268 and 2,059,269. Frank J. Nolan, Bridgeport, Conn., to Electro-Gas Corp., Rochester, N. Y.
Manufacture of nitrocellulose by nitrating cellulose pulp with mixed nitric and sulfuric acids. No. 2,059,326. Roderick K. Eskew, Portland, Me., to du Pont, Wilmington, Del.
Process for the decoloration of stabilized and bleached organic acid derivatives with alkaline cyanide. No. 2,059,380. Herbert E. Martin, Cumberland, Md., to Celanese Corp. of America, Del.
Improvement of the properties of organic acid derivatives of cellulose by treatment with activated carbon and silica gel. No. 2,059,381. Herbert E. Martin, Cumberland, Md., to Celanese Corp. of America, Del.
Treatment for improving bituminous coal by coating with a water solution of mixed sodium silicates and salt. No. 2,059,388. Joseph C. Nelms, East Cleveland, Ohio.
Process for sterilizing and drying eggs so as to obtain egg whites and albumen. No. 2,059,399. Henry I. Rosner, Brooklyn, to Joe Lowe Corp., N. Y. City.
Preparation of zinc sulfide pigments by the interaction of zinc and sulfur vapors in an inert atmosphere. No. 2,059,421. Robert Kerr Waring, Palmerton, Pa., to The New Jersey Zinc Co., N. Y. City.
Apparatus for analyzing exhaust gases. No. 2,059,428. Gerald H. Allen to Allen Electric & Equipment Co., both of Kalamazoo, Mich.
Compound consisting of calcium thiocyanate and a substance from the group hexamethylene tetramine and ammonia-formaldehyde. No. 2,059,-462. Heinrich Jungmann, Altona-Othmarschen, Ger., to Kali-Chemie A. G., Berlin, Ger.
Method of treating organic liquids with phosphorus pentoxide. No. 2,059,469. Boris Malishev, Berkeley, Calif.
Method of rectification of hydrocarbons. No. 2,059,494. Russell Norman Shiras, Compton, Calif.
Catalytic purification of oxygen-containing hydrogenation products of oxides of carbon. No. 2,059,495. Karl Smeykal, Leuna, Ger., to I. G., Frankfort, Ger.
Apparatus for the fractionation of liquids. No. 2,059,522. Charles Gilbert Hawley, Chicago, to Centrifix Corp., Cleveland.
Softening water by contact with activated alumina. No. 2,059,552. Harry V. Churchill, New Kensington, Pa.
Removal of fluorine from water by contact with activated alumina in the presence of alkali metal ions. No. 2,059,553. Harry V. Churchill, New Kensington, Pa.
Luminous discharge lamp. No. 2,059,640. Harrison Porter Hood, to Corning Glass Works, both of Corning, N. Y.

CATALYSTS OF BUSINESS



• Chemicals are the catalysts of modern industry. Their speeding-up action is being felt in nearly every field of enterprise—through products of better quality which are easier to make yet cost less to produce. As one of the largest and most progressive manufacturers of chemicals in the country, American Cyanamid offers you many advantages which you will find stimulating to action in your business . . . wide and productive research activity, the cooperation of a large and highly skilled technical staff, quick service from centrally located plants and warehouses, the satisfaction of knowing that all your chemical needs can be met promptly from one source of supply.

Above is a scene in the rubber industry, where Cyanamid service is steadily acting as an efficient "catalyst" of progress.

American Cyanamid & Chemical Corporation

30 ROCKEFELLER PLAZA • NEW YORK, N. Y.

(over)

(over)

Standardizing water for mashing processes. No. 2,059,645. Karl P. McElroy, Washington, D. C.

Removing carbon tetrachloride insoluble impurities from triphenyl phosphate by dissolving the triphenyl phosphate in carbon tetrachloride. No. 2,059,912, Marvin J. Reid, Rochester, N. Y., to Eastman Kodak Co., Jersey City, N. J.

Extraction and purification of sugar juices. No. 2,059,971. Ashton T. Scott, Bryn Mawr, Pa., to The Sharples Specialty Co., Philadelphia.

Method of casting refractories. No. 2,060,017. Raymond C. Benner to The Carborundum Co., both of Niagara Falls, N. Y.

Cellulose glycollic acid. No. 2,060,056. Deane C. Ellsworth, deceased, late of Wilmington, Del., by Joseph F. Haskins, administrator, to du Pont, both of Wilmington, Del.

Production of carbonylic compounds by conversion of unsaturated compounds with a halogen and water. No. 2,060,086. Carl T. Kautter, Berkeley, Calif.

Corrosion inhibitor comprising a mixture of cyclohexylamine and soap. No. 2,060,138. Maurice H. Taylor, Stoneham, Mass., to Merrimac Chemical Co., Everett, Mass.

Production of alcohols from hydrocarbon mixtures. No. 2,060,143. Gerald Henry Van de Griendt and William Engs, Berkeley, Calif.

Cooling process for the removal of moisture from high temperature gases produced by the oxidation of ammonia. No. 2,060,183. Gaston Lefort des Ylouses, Boulogne-sur-Seine, Fr., to L'Azote Francais, Fr.

Corrosion inhibitor comprising the precipitated product obtained by the neutralization of a solution of zinc chromate in chromic acid with caustic potash. No. 2,060,192. Walter Villa Gilbert, London, Eng.

Production of organic acid anhydrides by the reaction between a halogen-free carboxylic acid and a non-halogenated carboxylic acid chloride in the presence of a metallic salt. Stefan Goldschmidt and Rudolf R. Wolff, Karlsruhe, Ger., to The Kessler Chemical Corp., Orange, N. J.

Preparation of dispersions. No. 2,060,210. Winfield Walter Heckert, Ardentown, Del., to du Pont Rayon, N. Y. City.

Process for making sulfuric acid esters of aliphatic alcohols. No. 2,060,254. Hugo Siebenburger to Society of Chemical Industry in Basle, both of Basel, Switz.

Hydrogenation of alpha-ethyl-beta-propyl-acrolein in the presence of a nickel catalyst to produce alpha-ethylhexaldehyde, 2 ethyl-l-hexanol, and normal heptane. No. 2,060,267. Walter J. Toussaint, South Charleston, W. Va., to Union Carbide and Carbon Corp., N. Y.

Preparation of colloidal sulfur by acidifying an alkaline solution of a sulfide containing a protein. No. 2,060,311. Tadaichi Hashimoto, Tajunga, Calif., to Chemical Products, Inc. of Calif.

Conversion of unsaturated hydrocarbons to saturated hydrocarbons. No. 2,060,356. Gustav Wietzel, Ludwigshafen, and Georg Schiller, Mannheim, Ger., to I. G., Frankfort, Ger.

Miscible oil comprising a naphthenic acid soap, high boiling point solvent, free rosin, and a mineral oil. No. 2,060,425. Oliver Wood Neukon, Berkeley, to Union Oil Co., Los Angeles.

Separation of asphalt from liquid carbonaceous materials. No. 2,060,447. Karl Schoenemann, Heidelberg, Ger., to I. G., Frankfort, Ger.

Condensation products of phenols and triisobutylene. No. 2,060,573. William F. Hester, Drexel Hill, to Röhm and Haas Co., Philadelphia, Pa.

Treatment of pinene with formic and phosphoric acid to produce terpineol. No. 2,060,597. Donald H. Sheffield, Brunswick, Ga., to Hercules Powder Co., Wilmington, Del.

Processing graphite. No. 2,060,663. Kenneth C. De Walt, Schenectady, to General Electric Co., N. Y.

Process for making chromite refractories. No. 2,060,697. Gilbert E. Seil, Cynwyd, Pa., to E. J. Lavino and Co., Philadelphia, Pa.

Method of refrigeration. No. 2,060,728. Joseph Fleischer, Dayton, Ohio, to General Motors Corp., Del.

Esters of dihydronaphthalene-di-carboxylic acids. No. 2,060,829. Norman D. Scott, Niagara Falls, N. Y., to du Pont, Wilmington, Del.

Electrical treater for dispersing emulsions. No. 2,060,839. Logan C. Waterman, Long Beach, Calif., to Petroleum Rectifying Co. of Calif., Los Angeles.

Quaternary ammonium compounds. No. 2,060,850. William Stansfield Calcott, Penns Grove, N. J., and Richard Gesse Clarkson, Wilmington, Del., to du Pont, Wilmington, Del.

Nitrogen containing organic compounds. No. 2,060,851. William Stansfield Calcott, Woodstown, N. J., and Richard Gesse Clarkson, Wilmington, Del., to du Pont, Wilmington, Del.

Production of ethylene glycol. No. 2,060,880. Wilbur A. Lazier, Marshallton, Del., to du Pont, Wilmington, Del.

Rectification process for obtaining krypton and xenon. No. 2,060,940. Heinrich Kahle, Hoellriegelshreuth, near Munich, Ger., to Union Carbide and Carbon Corp., N. Y.

Hydrogen polysulfide addition products of unsaturated aliphatic hydrocarbons. No. 2,061,018. Wallace H. Carothers, Arden, to du Pont, Wilmington, Del.

Sulfurized unsaturated aliphatic hydrocarbons. No. 2,061,019. Albert S. Carter, Wilmington, and Frederick Baxter Downing, Carneys Point, N. J., to du Pont, Wilmington, Del.

Treatment of organic waste sludges. No. 2,061,022. Lindsay R. Christie, Pittsburgh.

Apparatus for electrical precipitation. No. 2,061,045. Heinrich Bernhard Ruder, Schonberg in Taunus, and Hermann Fiesel, Frankfort, Ger., to International Precipitation Co., Los Angeles.

High temperature refractory containing zircon, electrically fused refractory compounds, and silicon bonded together by phosphoric acid reaction products. No. 2,061,099. John D. Morgan, South Orange, N. J., and Russell E. Lowe, N. Y. City, to Doherty Research Co., N. Y. City.

Manufacture of antioxidants by treating a cracked petroleum distillate with a phenol-sulfuric acid mixture. No. 2,061,111. Donald R. Stevens, Swissvale, and William A. Gruse, Wilkinsburg, Pa., to Gulf Oil Corp., Pittsburgh.

Separation of ammonium salts from their mixtures with other salts. No. 2,061,128. Louis Andres, Grand-Couronne, Fr., to Societe d'Etudes pour la Fabrication et l'Emploi des Engrais Chimiques, Paris, Fr.

Manufacture of cement. No. 2,061,140. Pierre Coiffu to Societe des Ciments Francais et des Portland de Boulogne-sur-Mer et Compagnie des Portland de Desvres, both of Paris, Fr.

Free flowing sulfur containing 1% iodine. No. 2,061,185. John B. Ceccon, San Francisco, to San Francisco Sulphur Co., Calif.

Treatment of phosphates containing calcium with nitric acid and ammonia. No. 2,061,191. Antonius Foss, Olaf Jensen, and Odd Herbert Lunde to Norsk Hydro-Elektrisk Kvaelstofaktieselskab, all of Oslo, Norw.

Indigoid compounds containing fluorine. No. 2,061,200. Herbert A. Lubs and Arthur L. Fox to du Pont, all of Wilmington, Del.

Preparation of granular material. No. 2,061,246. Ernest H. Nichols, Hagerstown, Md.

Preparation of aliphatic nitriles by reacting fatty substances in the liquid phase with gaseous ammonia. No. 2,061,314. Anderson W. Ralston, William O. Pool, and James Harwood, to Armour and Co., all of Chicago.

Production of calcium hypochlorite bleach liquor, suitable for bleaching paper pulp, by the chlorination of lime. No. 2,061,332. John D. Rue, Niagara Falls, N. Y., to Hooker Electrochemical Co., N. Y. City.

Preparation of yellow pigments by precipitating cadmium sulfate solutions with barium sulfide solutions or a solution of zinc and cadmium sulfates with barium sulfide solution. No. 2,061,368. James J. O'Brien, Baltimore, Md., to The Glidden Co., Cleveland.

Heat resisting articles in wrought condition containing 0.1 to 11.5% aluminum, up to 30% chromium and the remainder iron. No. 2,061,370. Wilhelm Rohn, Hanau-on-the-Main, Ger.

Conversion of polyhalogenated alcohols. No. 2,061,377. Herbert P. A. Groll, Oakland, and George Hearne, Berkeley, Cal., to Shell Development Co., San Francisco.

Process for melting and treating organic substances employed in the manufacture of varnishes and the like. No. 2,061,469. Wilhelm Krumbhaar to Beck, Koller & Co., both of Detroit.

Production of methanol and other carbon compounds and catalytic agents for use therein. No. 2,061,470. Alfred T. Larson to du Pont, both of Wilmington, Del.

Purification of caustic hydroxide by dialysis. No. 2,061,505. Benjamin W. Collins, Swarthmore, to The Viscose Co., Marcus Hook, Pa.

Production of 3-chloro-2-methyl-aklyl alcohol from trichloroisobutane. No. 2,061,519. Ralph E. Nelson and Arthur O. Rogers, to Purdue Research Foundation, all of West Lafayette, Ind.

Production of sulfur by burning hydrogen sulfide with a limited amount of air under water. No. 2,061,523. Claude H. Smith, Tallmadge, Ohio, to Wingfoot Corp., Wilmington, Del.

Leather and Tanning

Leather-like material comprising a water-laid fibrous base impregnated with a rubber compound. No. 2,060,253. Henry Philip Shopneck, Danvers, Mass.

Process for tanning skins with a tanning solution containing a water soluble fatty acid amide. No. 2,061,063. Charles Dangelmajer, Niagara Falls, N. Y., and Ezra Clinton Perkins, Wilmington, to du Pont, Wilmington, Del.

Box toe for shoes comprising an absorptive base impregnated with a chlorine-containing rubber compound and a resin. No. 2,061,509. William W. De Laney, Marshallton, to Hercules Powder Co., Wilmington, Del.

Metals, Alloys, Ores

Process for burning pulverized pyrites to obtain sulfur. No. 2,058,480. Jean McCallum, Ferguson, and Richard T. Schraubstadter, University City, Mo., to St. Louis Smelt. and Ref. Co., St. Louis, Mo.

Production of iron-chromium alloys of high nitrogen content. No. 2,058,494. James N. Ostrofsky, to Rustless Iron and Steel Corp. of America, both of Baltimore, Md.

Process and apparatus for production of artificial filaments. No. 2,058,527. William Ivan Taylor, Spondon, near Derby, Eng., to Celanese Corp. of America, Del.

Anode for use in electrodeposition. No. 2,058,684. Albert B. Griggs, Shaker Heights, Ohio, to The Grasselli Chemical Co., Cleveland.

Anode for electrodeposition. No. 2,058,702. George Lutz, Rocky River, Ohio, to Grasselli Chemical Co., Cleveland.

An alloy containing from the platinum and palladium group 1 to 5%, an element from the cadmium and zinc group 5 to 20% and the remainder silver. No. 2,058,857. Kenneth L. Emmert to P. R. Mallory & Co., both of Indianapolis.

Welding electrode composed of 0.1 to 5.0% zinc, 0.1 to 2.5% chromium and the remainder copper. No. 2,058,873. Franz R. Hensel to P. R. Mallory & Co., both of Indianapolis.

Welding electrodes and electrical make-and-break electrodes composed of 0.1 to 5.0% zinc, 0.1 to 2.5% chromium, 0.05 to 5.0% silicon and the remainder copper. No. 2,058,874. Franz R. Hensel to P. R. Mallory & Co., both of Indianapolis.

Method of refining copper. No. 2,058,947. Jesse O. Betterton, Metuchen, N. J., to American Smelt. and Ref. Co., N. Y. City.

Bearing alloy consisting of ½ to 10% copper, 1 to 12% antimony, .01 to 10% tellurium, and the balance tin. No. 2,059,019. John V. O. Palm and Carl E. Swartz, Cleveland Heights, Ohio, to The Cleveland Graphite Bronze Co., Cleveland.

Hard metallic alloy composed of about 15% zirconium and about 85% boron. No. 2,059,041. Karl Schroter, Berlin-Lichtenberg, and Kurt Moers, Berlin-Charlottenburg, Ger., to G. E. Co., Schenectady, N. Y.

Electrical conductor insulation formed by applying a mixture of aluminum oxide and an aluminum halide and heating. No. 2,059,280. Samuel Ruben, N. Y. City, to Vega Mfg. Corp., Wilmington, Del.

Process of treating steel. No. 2,059,468. George Albert Lyon, Allenhurst, N. J.

Recovery of manganese compounds from carbonate ores. No. 2,059,499. Andrew T. Sweet, Houghton, and John D. MacCarthy, Detroit, to General Manganese Corp., Detroit, Mich.

Hot workable alloy containing 3-10% tin, 5-10% chromium, and the remainder copper. No. 2,059,555. Michael George Corson, N. Y. City, to Union Carbide and Carbon Research Laboratories, N. Y.

Alloy capable of being forged and worked at high temperatures having the composition: 3-10% tin; 0.5 to 10% chromium; up to 10% iron; and the remainder copper. No. 2,059,556. Michael G. Corson, N. Y. City, to Union Carbide and Carbon Research Laboratories, N. Y.

Hot workable alloy having the composition: 3-10% tin; 0.2-10% of mixtures of chromium and vanadium; and remainder copper. No. 2,059,557. Michael George Corson, N. Y. City, to Union Carbide and Carbon Research Laboratories, N. Y.

Hot workable alloy containing 3-10% tin, 0.2 to 10% of mixtures of chromium and vanadium, 0.2 to 10% iron, and remainder copper. No. 2,059,558. Michael George Corson, N. Y. City, to Union Carbide and Carbon Research Laboratories, N. Y.

Hot workable alloy containing 3-10% tin, 0.2% to 10% vanadium, 0.2 to 10% iron, and the remainder copper. No. 2,059,559. Michael George Corson, N. Y. City, to Union Carbide and Carbon Research Laboratories, N. Y.

Hot workable copper alloy containing 3 to 10% tin, and 0.2% to 10% vanadium. No. 2,059,560. Michael George Corson, N. Y. City, to Union Carbide and Carbon Research Laboratories, N. Y.

Manufacture of a composite metal consisting of a corrosion resistant surface and a metallic backing slab. No. 2,059,584. Wallace C. Johnson, Orange, N. J., to The Plykrome Corp., N. Y. City.

Homogeneous armor plate and process of heat treating. No. 2,059,746. Fritz Rittershausen to Fried. Krupp A. G. both of Essen, Ger.

Recovery of lithium from a ferruginious substance containing lithium phosphate by treating the substance with chlorine, separating the lithium chloride and electrolytically decomposing it, and re-using the chlorine. No. 2,059,750. Oskar Roder, Langelsheim, and Hans Siegens, Goslar, Ger., to American Lurgi Corp., N. Y. City.

Selectively coating the carbon steel of a composite structure containing carbon and stainless steels by treatment with a metal phosphate. No. 2,059,783. George J. Farnworth, Detroit, Mich., to Budd Wheel Co., Philadelphia, Pa.

Steel alloy resistant to the attack of hydrogen at high temperatures and pressures composed of up to 1% carbon, up to 1.5% silicon, up to 0.5% manganese, 0.4% to 5% titanium, and the remainder iron. No. 2,059,893. Freidrich Karl Naumann, Essen, Ger., to Fried. Krupp A. G., Essen, Ger.

Apparatus for refining impure magnesium by vaporization. No. 2,060,-070. Fritz Hansgirg, Radenthein, Austria, to American Magnesium Metals Corp., Pittsburgh.

Method of producing rolled products of magnesium and magnesium alloys. No. 2,060,071. Robert D. Lowry and Fred L. Reynolds to The Dow Chemical Co., all of Midland, Mich.

Method and apparatus for refining copper cathodes. Nos. 2,060,073 and 2,060,074. Russell P. Heuer, Haverford, Pa., to The American Metal Co. Ltd., N. Y. City.

Process for treating metals to protect them from oxidation and contamination. No. 2,060,133. The Colonial Trust Co. and Richard P. Weeks Summey, executors of estate of David L. Summey, deceased, to Scovill Mfg. Co., all of Waterbury, Conn.

Production of metal castings free from oxides. No. 2,060,137. Luther W. Bahney, Elizabeth, N. J., to Scovill Mfg. Co., Waterbury, Conn.

Formation of oxalate coatings on zinc, aluminum, magnesium and lead by dipping in an aqueous solution containing 1-10% ferric oxalate. No. 2,060,365. Leo P. Curtin, Cranbury, N. J., to Curtin-Howe Corp., N. Y. City.

Making lead powder. No. 2,060,375. Lyuho S. Ishimura, Kamikyo-Ku, Kyoto, Japan.

Recovery of thallium from cadmium-thallium cathodes. No. 2,060,453. Roscoe Teats, Denver, to American Smelting and Refining Co., N. Y. City.

Electrodeposition of silver on iron from a cyanide solution. No. 2,060,530. Alfred F. Reilly to Evans Case Co., both of North Attleboro, Mass.

Electrode for storage battery consisting of lead and 0.25% tellurium. No. 2,060,533. William Singleton, Wembley, William Hulme, Bush Hill Park, and Brinley Jones, Blackheath, to Goodlass Wall and Lead Industries Ltd., all of London, Eng.

Lead alloy. No. 2,060,534. William Singleton, Wembley, William Hulme, Bush Hill Park, and Brinley Jones, Ealing, to Goodlass Wall and Lead Industries Ltd., all of London, Eng.

Recovery of free silver and free iodine from silver iodide. No. 2,060,539. Joseph R. Spies, College Park, Md.

Flotation process. No. 2,060,815. Merrill W. MacAfee, Berkeley, Calif.

Manufacture of a copper-cuprous oxide rectifier. No. 2,060,905. George O. Smith, Bloomfield, N. J., to Bell Telephone Laboratories, Inc., N. Y. City.

Zinc alloy containing 0.02% to 0.25% of metal of the nickel-cobalt group, 0.001% to 0.03% silicon, 0.10% to 0.30% lead. No. 2,060,920. Henry Charles Anstey, Cheadle, Stoke-on-Trent, and William Ernest Alkins, Leek, to Thomas Bolton & Sons Ltd., Widnes, Eng.

Zinc alloy containing 0.10% to 0.60% of the nickel-cobalt group, 0.01% to 0.15% silicon, and at least 97% zinc. No. 2,060,919. Henry Charles Anstey, Cheadle, Stoke-on-Trent, and William Ernest Alkins, Leek, to Thomas Bolton & Sons Ltd., Widnes, Eng.

Nickel plating ferrous articles by plating over a deposit of a copper zinc alloy that is higher than zinc in the E. M. F. series. No. 2,061,056. Edwin M. Baker, Ann Arbor, Mich., and Leslie C. Borchert, Chicago, to General Spring Bumper Corp., Detroit.

Flotation. No. 2,061,201. Merrill W. MacAfee, Berkeley, Calif.

Process for separating metals by volatilization of one while keeping the remainder in a liquid state. No. 2,061,251. Melville F. Perkins, Woodbridge, N. J., to American Smelt. and Ref. Co., N. Y. City.

Preparation of an alloy containing 10% sodium, 89.95% to 89.00% lead and 0.05% to 1.00% magnesium. No. 2,061,267. Frederick Baxter Downing, Carneys Point, Louis Samuel Bake, Penns Grove, and Alfred E. Parmelee, Carneys Point, N. J., to du Pont, Wilmington, Del.

Paper and Pulp

Manufacture of coated paper which has a coating containing 70-85% mineral filler composed of carbonate filler, satin white, starch, and casein. No. 2,059,343. Frank Hadfield, Chillicothe, Ohio, to The Mead Corp., Dayton, Ohio.

Method of sizing paper. Nos. 2,059,464 and 2,059,465. Otto Kress and Charles E. Johnson, to The Institute of Paper Chemistry, all of Appleton, Wis.

Manufacture of paper containing an alkaline filler. No. 2,060,824. Harold Robert Rafton, Andover, Mass., to Raffold Process Corp., Mass.

Process for drying and impregnating green wood. No. 2,060,902. Alfred Joaquin Stamm, Madison, Wis.

Pulping process for wood material. No. 2,061,205. Fredrich Olsen, Alton, Ill., to The Cellulose Research Corp., Del.

Petroleum and Petroleum Chemicals

Conversion of hydrocarbon oils. No. 2,058,488. Jacque C. Morrell, to Universal Oil Products Co., both of Chicago.

Treatment of hydrocarbon oils to promote rearrangements. No. 2,058,-534. Justin F. Wait, N. Y. City.

Process for breaking petroleum emulsions by treating with an unsaponified de-emulsifying agent containing an aldehyde-carboxylic-acid residue. No. 2,058,568. Ivor Milton Colbeth, Belleville, N. J., to The Baker Castor Oil Co., N. Y. City.

Process for breaking petroleum emulsions by treating with an unsaponified blown fatty oil. No. 2,058,569. Ivor M. Colbeth, East Orange, N. J., to Baker Castor Oil Co., N. Y. City.

Process for breaking petroleum emulsions by treating with a reaction product of a blown fatty oil and an aldehyde reactive agent. No. 2,058,-570. Ivor M. Colbeth, East Orange, N. J., to Baker Castor Oil Co., N. Y. City.

Process of stabilizing and imparting a green fluorescence to hydrocarbon oils. No. 2,058,696. Arthur Lazar, Associated, and John Manderson Evans, Berkeley, Calif., to Associated Oil Co., San Francisco.

Process for sweetening mercaptan-bearing petroleum oil by contact with a metallic halide solution having an oxidation potential within the range of 330 to 450 millivolts. No. 2,058,720. James A. Reid and Walter A. Schulze to Phillips Petroleum Co., all of Bartlesville, Okla.

Oil-cracking vessel. No. 2,058,768. Henry J. Broderson, Galveston, Tex., to Standard Oil Co. (Ind.).

Method of marking petroleum products with oil soluble radioactive salts. No. 2,058,774. Francis Xavier Colligan to The Texas Co., both of N. Y. City.

Catalytic destructive hydrogenation of carbonaceous materials using as catalyst a compound of the group silico molybdic acids and silico tungstic acid and their salts. No. 2,058,789. Paul Herold and Hermann Kaufmann, Leuna, Ger., to Standard I.-G. Co., Linden, N. J.

Method of inhibiting gum formation in cracked gasoline by addition of reaction product of an olefin and a wood tar distillate. No. 2,058,881. Vladimir Ipatieff to Universal Oil Products Co., both of Chicago.

Continuous process for dewaxing mineral oils by pressure filtration of an oil-solvent solution. No. 2,058,944. Dwight P. Bailey, Bayonne, Robert Beattie, Plainfield, and Walter S. Tyler, Jr., Elizabeth, N. J., three-fourths to Tide Water Oil Co., N. Y. City.

Desulfurizing light hydrocarbons by treatment with hydrogen chloride and a metal oxide soluble in hydrochloric acid. No. 2,058,958. Roland B. Day to Universal Oil Products Co., both of Chicago, Ill.

Preparation of road oils by treatment of pressure tar with dilute chlorine gas. No. 2,059,051. Joseph W. Sparks, Hammond, Ind., to Standard Oil Co. (Ind.) Chicago.

Process of sweetening hydrocarbon distillates containing mercaptans. No. 2,059,075. David Louis Yabroff and John Wilkinson Givens, Berkeley, Calif., to Shell Development Co., San Francisco.

Continuous process for dewaxing hydrocarbon oils by filtering chilled solution of oil and propane. No. 2,059,166. Daniel B. Banks, Upper Darby, Pa., and Paul D. Barton, Scarsdale, N. Y., to Sun Oil Co., Philadelphia.

Wax-containing lubricating oil containing as a pour depressor an aluminum salt of the organic acids produced by oxidation of paraffin wax. No. 2,059,192. Edwin J. Barth, Chicago, and Ralph P. Corlew, Hammond, Ind., to Sinclair Refining Co., N. Y. City.

Conversion of hydrocarbon oils. Nos. 2,059,290 and 2,059,291. Kenneth Swartwood to Universal Oil Products Co., both of Chicago, Ill.

Increasing the production of wells by the introduction of an aqueous fluid and a non-aqueous fluid capable of liberating on dilution an acid which will react with the formation. No. 2,059,459. Walter J. Hund, Oakland, Albert G. Loomis, Berkeley, Calif., and Samuel Ernest Lambert, Jr., Tulsa, Okla.

Oil cracking apparatus. No. 2,059,527. William Kaplan, Lynbrook, N. Y. to Doherty Research Co., N. Y. City.

Emulsified compounds containing hydrocarbons. No. 2,059,535. Robert H. Russell, Cleveland, to Gas Fuel Corp., N. Y. City.

Process for producing oil gas from emulsified mixtures. No. 2,059,-536. Robert H. Russell, Cleveland, to Gas Fuel Corp., N. Y. City.

Production of light hydrocarbons and lubricating oil stock by treatment of petroleum vapors at high temperatures with alkali metals and alkali compounds. No. 2,059,542. Justin F. Wait, N. Y. City.

Process for destructive hydrogenation of hydrocarbon oils. No. 2,059,-625. Carbon P. Dubbs, Wilmette, Ill., to Universal Oil Products Co., Chicago.

Art of coking hydrocarbons. No. 2,059,734. William Walton Johnson, Houston, Tex., to Sinclair Refining Co., N. Y. City.

Dewaxing hydrocarbon oils. No. 2,059,837. John A. Anderson to Standard Oil Co. (Ind.), both of Chicago, Ill.

Removal of sulfur from petroleum by contacting the petroleum vapors at high temperatures and pressures with an absorbent to convert the sulfur in organic sulfur compounds to hydrogen sulfide. No. 2,060,091. Arthur L. Lyman, Berkeley, Calif., to Standard Oil Co., Calif., San Francisco, Calif.

Treatment of emulsions resulting from the treatment of oils with plumbite to recover valuable products. No. 2,060,108. John Louis Oberseider and Paul L. Robison, to The Atlantic Refining Co., both of Philadelphia.

Decomposition of organic sulfur compounds in cracked petroleum naphtha by contact at high temperatures with a cadmium sulfide catalyst. No. 2,060,112. Ralph B. Pierce and Aubrey W. Trusty, to Louisiana Oil Refining Corp., all of Shreveport, La.

Method for breaking petroleum emulsions with a polymerized, blown and sulfonated vegetable oil. No. 2,060,281. Edwin E. Claytor, Tulsa, Okla.

Refining of hydrocarbon oils with aqueous solutions of zinc and like water-soluble refining agents. No. 2,060,291. Gustav Egloff to Universal Oil Products Co., both of Chicago.

Process and apparatus for dewaxing oils. No. 2,060,517. David R. Merrill, Long Beach, Calif., to Union Oil Co., Los Angeles.

Dewaxing lubricating oil with solvent liquid. No. 2,060,805. Francis X. Govers, Vincennes, Ind., to Indian Refining Co., Lawrenceville, Ill.

Polymerization of gaseous hydrocarbons to liquids in presence of a catalytic acid of phosphorus and a metallic salt. No. 2,060,871. Vladimir Ipatieff, to Universal Oil Products Co., both of Chicago.

Reduction of pour point of hydrocarbon oils by the addition of resinous condensation products. No. 2,061,008. Orland M. Reiff, Woodbury, N. J., to Socony-Vacuum Oil Co., N. Y. City.

Method and apparatus for treating emulsions. No. 2,061,197. Clarence F. Diech to Petroleum Rectifying Co. of Calif., both of Los Angeles, Calif.

Method of lubricating internal combustion engines by utilizing hydrocarbon oils containing a component which increases the oiliness but not the viscosity. No. 2,061,328. William B. D. Penniman, Baltimore.

Dewaxing hydrocarbon oil. No. 2,061,541. Francis X. Govers, Vincennes, Ind., to Indian Refining Co., Lawrenceville, Ill.

Resins, Plastics, etc.

Polyhydric phenol-inorganic polybasic resin. No. 2,058,394. James Augustus Arvin to du Pont, both of Wilmington, Del.

Production of a synthetic resin from phenol, formaldehyde, acetic or lactic acids, and glycerol tri-acetate. No. 2,058,475. Karl Loos, Astoria, N. Y., to Joseph Hirschman, N. Y. City, fifteen one-hundredths.

Polyether resin. No. 2,058,510. Henry S. Rothrock to du Pont, both of Wilmington, Del.

Manufacture of phenol-aldehyde resins. No. 2,058,649. George H. Wilder, Arlington, N. J., to du Pont, Wilmington, Del.

Production of oil soluble phenol-aldehyde resins. No. 2,058,797. Herbert Hönel to Beck Koller & Co., both of Detroit, Mich.

Method of preparing colored plastic molding powders. No. 2,059,394. Alan F. Randolph, Montclair, N. J., to du Pont, Wilmington, Del.

Quick curing infusible molding resins. No. 2,059,526. Kenneth M. Irey, Ridgefield Park, N. J. and Lloyd C. Swallen, Terre Haute, Ind., to Resinox Corp., N. Y. City.

Molding composition comprising a urea-formaldehyde condensation product, an acid yielding salt of hexamethylene tetramine and hexamethylene tetramine. No. 2,059,609. Edmund Charles Rossiter and Alfred Brookes, Strand, London, Eng., to American Cyanamid Co., Me.

Synthetic resin formed by the interaction of glycerol, phthalic anhydride, and a non-hydroxylated fatty oil. No. 2,059,842. William Baird and Rowland Hill, Manchester, Eng., to Imperial Chemical Industries, Ltd., Gt. Brit.
Synthetic resin produced by reaction of a polyhydric alcohol and polybasic acid, including a mono- and di-hydric ketone alcohol. No. 2,059,-850. Cole Coolidge to du Pont, both of Wilmington, Del.
Synthetic resin produced by reaction of naphthanone and an aldehyde. No. 2,059,943. George De Witt Graves to du Pont, both of Wilmington, Del.
Method of coating abrasive particles with a resin. No. 2,059,983. Harry M. Dent, Buffalo, and Arthur J. Norton, to General Plastics, both of Tonawanda, N. Y.
Manufacture of a pyro resin by heating thermo-plastic vinyl ester resin in the presence of a chloride of the group bismuth, iron, and tin. No. 2,060,035. Newcomb K. Chaney, Cleveland Heights, and Wilbur B. Dexter, Lakewood, Ohio, to Union Carbide and Carbon Corp., N. Y. City.
Manufacture of synthetic resins by condensation of dicyandiamide with formaldehyde. No. 2,060,122. Kurt Ripper, Berlin, Ger.
Treatment of vinyl type monohalides. No. 2,060,303. Herbert P. A. Groll, Oakland, and George Hearne, Berkeley, Calif.
Decolorization of unsaturated hydrocarbon resins by dissolving in hydrocarbon solvents and decolorizing with a bleaching clay. No. 2,060,404. Charles A. Thomas and William H. Carmody to Monsanto Petroleum Chemicals, all of Dayton, Ohio.
Synthetic resins, condensation products of α alkylene oxide and a phenol-aldehyde resin of the novolak or resol-type. No. 2,060,410. Gerhard Balle to I. G., Frankfort, Ger.
Preparation of phenol-formaldehyde condensation products. No. 2,060,-457. George Barsky, N. Y. City.
Resinous compositions. No. 2,060,665. Walter W. Durant, Pittsfield, Mass., and Paul H. Scrutchfield, Evanston, Ill., to General Electric Co., N. Y.
Synthetic resins. Nos. 2,060,715 and 2,060,716. James A. Arvin to duPont, both of Wilmington, Del.
Resin base coating for containers. No. 2,060,928. Frederick M. Damitz, Irvington, N. J., to Irvington Varnish & Insulator Co., Irvington, N. J.

Rubber

Form for producing dipped rubber articles which has composite walls to which the rubber dispersion has unequal adhesion to produce articles having varying thickness. No. 2,058,552. Harold Becher and Jacob Stein, N. Y. City; said Becher to said Stein.
Vulcanizing rubber compounds using an acid with the formula $(CH)_2(COOH)_2$. No. 2,058,840. Herman R. Thies, Akron, to Wingfoot Corp., Wilmington, Del.
Process for bonding rubber to metal. No. 2,058,865. Thomas R. Griffith to Russell J. Reaney, both of Ottawa, Ontario, Canada.
Sheet rubber. No. 2,059,203. Elmer G. Gird, LaPorte, Ind., to duPont, Wilmington, Del.
Process for making sponge or gassed rubber. No. 2,059,278. Walter Scott Robinson, LaPorte, Ind., to duPont, Wilmington, Del.
Manufacture of vulcanized rubber. No. 2,059,284. James W. Schade, Akron, to The B. F. Goodrich Co., N. Y. City.
Production of rubber composition consisting of latex and slag dust. No. 2,059,430. Thomas Arnold and Stanley Arnold, Bradford, Eng.
Compounded, milled rubber composition. No. 2,059,448. Albert K. Epstein and Benjamin R. Harris, Chicago.
An elastic and substantially liquid-impermeable mixture containing caoutchouc for mortars or binders. No. 2,059,778. Karl Dietz, Frankfort, and Karl Frank, Bad Soden-on-the-Taunus, Ger., to I. G., Frankfort, Ger.
Rubber coating fabric work gloves by dipping in a solution consisting of latex, ammoniated casein, Kadox, butyl zimate, a wetting agent, caustic soda, sulfur and water and then vulcanizing. No. 2,060,343. Robert C. Palicki, Toledo, Ohio.
Preparation of rubber by treating latex with an alkali solution, coagulating with an alcohol, separating and washing the rubber. No. 2,061,-276. John H. Ingmanson, Rahway, N. J., to Bell Telephone Laboratories, N. Y. City.
Improving age-resisting properties of rubber by treatment with a reaction product of wood creosote and a primary aromatic amine. No. 2,061,451. Albert M. Clifford, Stow, Ohio, to Wingfoot Corp., Wilmington, Del.
Preserving rubber by treatment with an addition product of phenol containing at least two discrete rings and an amine. No. 2,061,531. William D. Wolfe, Cuyahoga Falls, Ohio, to Wingfoot Corp., Wilmington, Del.

Textile, Rayon

Production of textile material exhibiting crepe effects. No. 2,058,421. William Alexander Dickie and Robert Wighton Moncrieff, Spondon, near Derby, Eng., to Celanese Corp. of America, Del.
Production of crepe yarns by shrinking yarns containing cellulose acetate. No. 2,058,423. William Alexander Dickie, Donald Finlayson, and Percy Frederick Combe Sowter, Spondon, near Derby, Eng., to Celanese Corp. of America, Del.
Production of cellulose acetate crepe yarns by treatment with a swelling agent in aqueous medium. No. 2,058,427. Henry Dreyfus, London, and William Alexander Dickie, Spondon, near Derby, Eng., to Celanese Corp. of America, Del.
Manufacture of reenforced plastic dope sheet material. No. 2,058,476. Louis E. Lovett, Cleveland Heights, Ohio, to Industrial Rayon Corp., Cleveland.
Production of crepe fabrics from fabrics containing crepe twisted threads of cellulose derivatives. No. 2,058,778. Ray P. Dinsmore, Akron to Wingfoot Corp., Wilmington, Del.
Method of purifying and bleaching cellulose fibre. Nos. 2,058,791 and 2,058,792. Adam Hoche, Brooklyn, N. Y.
Production of velvet and pile fabric from organic cellulose derivatives. No. 2,059,309. Henry R. Bodell, N. Y. City, to Celanese Corp. of America, Del.
Method of removal of dyestuffs, which have been bled from fabrics, from dry cleaning solvent by use of activated absorbent earths. No. 2,059,475. Latimer D. Myers to Emery Industries, both of Cincinnati, Ohio.
Manufacture of artificial silk of wool-like character from alkaline cellulose solutions by the addition of an animal or vegetable albuminous substance to the spinning solutions. No. 2,059,632. Paul Esselmann, Wolfen Dreis Bitterfield, and Karl Kosslinger, Dessau in Anhalt, Ger. to I. G., Frankfort, Ger.
Water resistant indurated fiber. No. 2,059,947. Duncalf W. Hollingworth to Continental-Diamond Fibre Co., both of Newark, Del.
Addition of finely dispersed mixtures of hydrogenated fat and mineral oil to improve the suppleness of artificial silk. No. 2,060,016. Henri-Louis Barthelemy, Rome, Ga., to Tubize Chatillon Corp., Del.
Delustering cellulose acetate silks with a water-insoluble zinc salt of a higher fatty acid. No. 2,060,047. Camille Dreyfus, N. Y. City, and William Whitehead, Cumberland, Md., to Celanese Corp. of America, Del.
Stiffening fabrics containing cellulose derivatives with a solution containing 10 parts of diacetone alcohol and 90 parts carbon tetrachloride. No. 2,060,113. Herbert Platt, Cumberland, Md., to Celanese Corp. of America, Del.
Dyeing of acetate artificial silk. No. 2,060,186. Friedrich Felix, Max Bommer, and Wilhelm Huber, to Society of Chemical Industry in Basle, all of Basel, Switz.
Apparatus for drying rayon cakes. No. 2,060,515. Thomas McConnell, Northampton, Mass., to Hampton Co., Easthampton, Mass.
Method of removing sericin from silk. No. 2,060,529. Warren T. Reddish to Emery Industries, both of Cincinnati, Ohio.
Treatment of cellulose fibres to prevent deleterious effects of ageing. No. 2,060,733. James Karr Hunt and George Henry Latham to duPont, all of Wilmington, Del.
Production of alloprene rayon. No. 2,060,786. Rudolph S. Bley, Elizabethton, Tenn., to North American Rayon Corp., N. Y. City.
Viscose and cuprammonium cellulose spinning solutions. No. 2,060,-787. Rudolph S. Bley, Elizabethton, Tenn., to North American Rayon Corp., N. Y. City.
Fabric coated with hydrogenated rubber, ethyl cellulose and an alkyl phthalate. No. 2,061,127. Alfonso M. Alvarado, Robert B. Flint, and Leo Phillip Hubbuch, to duPont, all of Wilmington, Del.
Recovery of copper from wash solutions obtained in the cuprammonium rayon process. No. 2,061,194. Sverre Gulbrandsen, Woodbury, N. J., to New Process Rayon, Del.
Process for the leveling of the size of silk and rayon fabrics finished with a water sensitive size by using a dry cleaning solvent consisting of volatile and chlorinated hydrocarbons containing dispersed moisture. No. 2,061,211. Warren T. Reddish to Emery Industries, both of Cincinnati, Ohio.

Water Treatment

Method of sewage disposal. No. 2,059,286. Noel Statham, Irvington-on-Hudson, N. Y.
Sterilization of pulp and white water by addition of chloramine. No. 2,061,031. Clark T. Henderson, Burlingame, Calif., to Wallace & Tiernan Co., Belleville, N. J.

The Literature

"The Evaluation of Textile Waterproofing Agents," by Robert N. Wenzel, *American Dyestuff Reporter*, Nov. 2nd, p598.
"The Training of the Chemist for the Service of the Community," *Chemistry and Industry*, Oct. 23rd, p820.
"Natural Gas, Carbon Black, and Gasoline Expansion," *The Oil and Gas Journal*, Nov. 15th, p68.
"The Chemical Aspects of Dermatitis," by H. E. Cox, *Chemistry and Industry*, Oct. 9th, p775.
"Glass-Clear Plastics," *British Plastics and Moulded Products Trader*, October, p228.
"Metals of the Platinum Group," by R. H. Atkinson and A. R. Raper, *The Industrial Chemist*, October, p438.
"The Toxicity of Industrial Solvents," by Ralph G. Harry, *The Manufacturing Chemist*, October, p345.
"Plating Equipment," by Edwin M. Baker, *Metals & Alloys*, November, p287.
"The Growth and Inhibition of Mildew," by J. F. Holmes, *Textile Colorist*, October, p737.
"Plating Economy Demands Control of 'Drag Out' Losses from Plating Solutions," by George B. Hogaboom, *Metal Cleaning & Finishing*, October, p677.

Miscellaneous Booklets

"Chemical Utilization of Wood" by Henry K. Benson, chairman, Division of Chemistry and Chemical Technology, National Research Council, Washington, D. C. Available from the Supt. of Documents, Washington, D. C., 15c.
Consumption of Primary and Secondary Tin in the U. S. in 1935. Bureau of Mines Information Circular, No. I. C. 6930.
Massachusetts Agricultural Experiment Station, Bulletin No. 333, Massachusetts State College, Amherst, Mass.
"Use of Electricity in Oregon with Forecasts of Future Demands" contains a wealth of information about the availability, use and cost of electricity in the state of Oregon. State Planning Board, Salem, Ore.
Interchangeable Ground-Glass Joints, Stopcocks, and Stoppers. Numbered Edition of Commercial Standard CS21-36. Available from the Supt. of Documents, Washington, D. C., 5c.
Directory of Commercial Testing and College Research Laboratories, U. S. Dept. of Commerce, National Bureau of Standards, Miscellaneous Publication M125. Available from the Supt. of Documents, Washington, D. C., 15c.
Current (1936) edition of the compilation of "A.S.T.M. Standards on Petroleum Products and Lubricants," which is sponsored each year by Committee D-2, gives in their latest approved form 56 methods of test, 5 specifications and 2 lists of definitions of terms relating to petroleum and to road materials. Standards are given in the publication pertaining to a large number of petroleum products, including:

Kerosene Oils	Crude Petroleum	Paraffin Wax
Lubricating Oils	Gasoline, Naphtha, etc.	Bituminous Materials
Petrolatum	Natural Gasoline	Fuel Oils
Refined Petroleum Oil	Grease	Emulsified Asphalts

Copies of this publication, 372 pages, heavy paper cover, can be obtained from A.S.T.M. Headquarters, 260 S. Broad st., Philadelphia, at $2.00 per copy. Special prices are in effect on orders for 10 or more copies.

Plant Operation and Administration

A. E. Staley Manufacturing Company, Decatur, Illinois, opens its new soybean oil extraction plant.

A Digest of New Methods and Equipment for Chemical Makers

Erection and Equipment of a New Chemical Plant

By J. H. West

ERECTION and equipment of a chemical plant involves considerable details, which, if handled systematically, can be regulated successfully, the operations conducted with surprising smoothness and attended by well-worth-while economies. The routine diagram shows all the various stages through which practically every item of plant and equipment has to pass from start to finish, and the points where delay may and probably will occur.

Four parties are concerned in the matter, first the supplier of basic technical information, which we will call the Information Dept., or I.D.; secondly, the Construction Dept., or C.D., which translates information received from the I.D. into practical shape, makes the drawings, prepares specifications, places orders and contracts, and generally gets the work done; thirdly, the General Management, or G.M., which looks after finances, and authorizes orders and contracts; and lastly, the Contractor or Supplier, S., who manufactures and very likely erects the equipment and puts up the buildings.

Heavy black vertical line on the diagram shows the normal time required for each stage of the routine, and the gaps indicate delays, which, it will be noted, may occur at 15 points. Obviously the diagram is not to scale since the normal times will vary with each item, but a study of the diagram is useful before filling in the time program sheet, since it is quite useless to put down times in the latter which are normal or net; allowance must be made for delays which are bound to occur to some extent. It is much better to draw up a conservative program and to be able to keep to it or even anticipate it slightly than to draw up an optimistic one and fail. We will now go through the various stages of office routine and note the important points to keep in mind at each, and the best ways of saving work and avoiding delay.

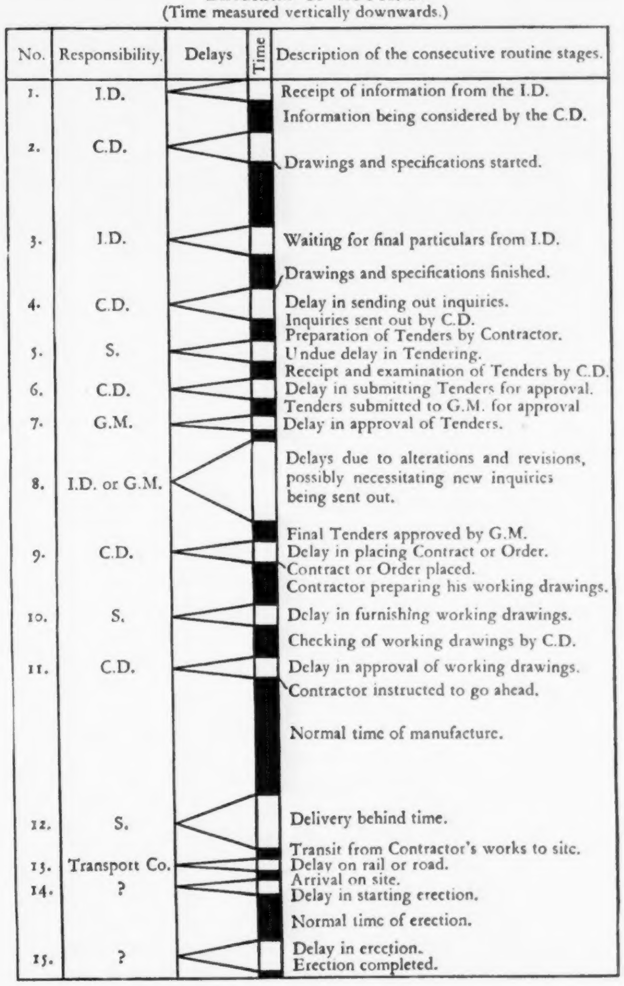
When the I.D. have ready particulars of a given item a representative of the C.D. should run through the particulars personally with the I.D. man who prepared them, especially if he is a chemist. Ambiguities will be cleared up and vital information lacking can be supplied.

In the preparation of drawings, little need be said beyond emphasizing necessity for careful checking. The extra time spent on this may save costly mistakes and delays later on. The main points to be checked are, that dimensions are correct, *i.e.*, that chain dimensions agree with overall dimensions, and that dimensions in different views agree; that the drawings and specification agree on all points; and that all necessary information is given. The specification should start with a statement of what it covers, *i.e.*, number, and type of machines or vessels; for instance. "The manufacture, delivery, erection, and testing of 4 sets of direct-coupled motor-driven centrifugal pump sets including combined bed-plates." The duty and conditions of working should next be given, and after that specification of the materials to be used for various parts. Fittings should be specified, and also any tests to be carried out either at the manufacturer's works or after erection. If the contractor is to erect, he should be told the height from the ground at which the plant is to be erected if not on the ground floor, and it should be made clear whether he is to provide lifting tackle and scaffolding, and unskilled as well as skilled labor. Provisions of holding-down bolts and the grouting in of machine and bolts should be mentioned if the contractor is to do this work.

Great convenience and saving of time are obtained if lists of plant and equipment have the items provided with plant reference numbers. These should be so arranged as to be a key to where any given item belongs. Number should begin with a letter indicating the building or section in which the item will be located, followed by a number indicating the main item of plant to which it belongs, and finally a number indicating the individual item. For instance, item A31/7 may be the starter for the motor of a rotary drier 31 in Building A, and B65/9 may be the cooling coil in tank 65 in Building B. These references should be used on all documents. They save a great deal of confusion and result in everybody, whether at head office, consultant's office, the site, or contractor's works, knowing exactly what is referred to when a given item is mentioned.

The sending out of hundreds of inquiries is a tedious business, and if the job is a big one it pays handsomely to get out a standard printed form of inquiry embodying all the wording which is common to all inquiries. It is then only necessary to fill in the name of the contractor or supplier, the brief description of the goods inquired for (this should be identical with that at the top of the specification), the date by which tenders must be received, and the numbers of the drawings enclosed. This form is then mailed with a copy of the specification, prints of the drawings, and a copy of the "General Conditions of Contract for Plant and Equipment."

DIAGRAM OF ROUTINE.
(Time measured vertically downwards.)



On any but the smallest jobs it is necessary to draw up a set of "General Conditions of Contract"; in fact 2 of these will be necessary, one for building work and one for plant and equipment. These conditions deal with matters common to all

contracts, and save their repetition in the specifications for individual pieces of plant; such things as, workmanship and quality being of the best, contractor's men on site being paid union rates of wages, procedure in the event of a contractor becoming bankrupt or failing to complete his contract, arbitration in case of disputes, and so on.

For small orders not involving erection a shortened set of "Conditions of Purchase" may be used. It should be clearly stated that acceptance of these "Conditions" by the contractor or supplier is an essential part of the contract and that they shall override any "Conditions of Tender" which may be printed on or sent with the tender. On the standard inquiry form the guaranteed time of delivery reckoned from the date of order or instructions to proceed, should be asked for, and, if erection is included, the time required for erection and completion ready to operate.

A few words are desirable regarding the handling of tenders when received. A summary should be made out showing the respective prices and dates of delivery, with a column in which any differences between the various offers as regards quality, robustness, or the inclusion or omission of fittings or accessories should be noted. What is considered to be the most advantageous offer from all points of view should then be accepted without further communication with the tenderers unless any point in the offer needs elucidation. Representatives of tenderers should not be allowed to call and discuss their offers before a decision is reached, and they should never be allowed to amend their tenders except in the case of an obvious mistake or slip. The practice of certain firms, who hold a sort of Dutch auction after receipt of tenders by telling the tenderers that their price is high and allowing them to amend it, is thoroughly dishonest and constitutes, in the writer's opinion, a very shady way of doing busines, but it is not as uncommon as one would expect.

One final point regarding the standard inquiry form is that the tenderer should be invited to submit as an alternative offer his nearest standard apparatus. Savings can generally be effected if a standard article can be utilized. Tenders should be accompanied by a full specification of what is offered, with a clear disclaimer of any accessories or services which are *not* included, and the drawings necessary to show the details of construction. Working drawings will only be supplied after the order is placed.

It is a good plan to place the order in 2 stages. As soon as it is decided which offer is to be accepted a standard printed "Acceptance of Tender" form can be posted. This enables the contractor to order the materials for the job and to start his working drawings which have to be submitted for approval. This form should give the actual calendar dates on which delivery and completion are due on the times given in the tender and the contractor should be asked to confirm these. At this stage there may be a few minor modifications to be introduced by one side or the other involving changes in price. When all these have been finally adjusted the official "Order" form can be mailed. Standard printed "letters of regret" should be sent to the unsuccessful tenderers.

Contractor's Working Drawings Should be Checked

As soon as the contractor's working drawings come in they should be most carefully checked. This is the last chance to spot mistakes. If they are not promptly returned the contractor will have a good excuse for being behind time. Prints of the contractor's approved drawings should be sent to the site so that the resident engineer will be familiar with them when the equipment arrives. If inspection during manufacture is to be carried out copies of specifications and approved drawings should be sent to the inspector with the name and address of the works where the plant is being made.

Before leaving the subject of contracts and orders, something should be said about "Schedule Contracts" as opposed to lump sum contracts. Most building contracts are schedule contracts and some of the plant and equipment contracts will also be of this type. Take the lagging of steam pipes. This is practically always done on a schedule of prices, so much per foot run for each diameter of pipe with extras for covering flanges and valves. When the job is finished it is measured up and payment made accordingly. The supply, with or without erection, of all kinds of pipework is also frequently arranged on a schedule basis. This system has the advantage that the contract can be let before all the drawings are ready, and time is saved in obtaining lump-sum quotations for many different items. On the other hand, the total amount of expenditure involved is not known until the contract is completed and measured up.

One of the most important aspects of the office work is that of progressing, or "chasing" as it is sometimes known. It is at least one man's whole-time job, first to know exactly what the position is regarding any item at any given moment, and, secondly, to see that no delay is occurring at any of the fifteen points indicated on the chart. The progress man needs to be a hustler who will go bald-headed after anyone who is holding up the job from general manager to junior clerk. He will keep a book or a series of sheets on which the dates of passing each stage in the routine are entered for every item, and if any item gets overlooked or hung up at any stage it is his job to find out the reason why, and get the necessary person or people to do something about it then and there. Another of his duties is to see that the resident engineer on site is provided with copies of all drawings and specifications, and at the end of each month with a list of the plant items due for delivery during the coming month with the dates for each. Part II of a series of plant articles appearing in British, *The Chemical Age.*

Chemical Pipelines of Polyvinyl Chloride Resins

Pipelines and fittings fabricated from polyvinyl chloride synthetic resins are used in German chemical and process plants. Material resists most acids and alkalis, mechanical properties are satisfactory, and it can be fabricated and manipulated easily. *Die Chemische Fabrik,* Sept. 30th, Dr. Hans Lutz.

Glycerine Dehydrating Manufactured Gas

Glycerine is serving successfully for the partial dehydration of manufactured gas in several British plants. Only routine attention required, in addition to the daily reconcentration of the weak glycerine, is occasional cleaning of the jet condenser in the vacuum evaporator. Amount of glycerine required to replace losses is less than first reported. British, *The Chemical Trade Journal,* Oct. 30th, p364.

Standard Tests for Detecting Toxic Gases

Association of British Chemical Manufacturers and the British Government are working out standard tests for detecting small quantities of toxic gases. One on hydrogen sulfide is ready, and can be obtained through H. M. Stationery Office, London.

Recommended Tests for Superphosphate

The International Superphosphate Manufacturers' Association recommends that in all new phosphate-rock contracts a clause should be inserted that where analyses of deliveries are necessary in arbitrations, the molybdenum method only should be used. Two alternative methods of carrying out the analysis are recommended: (1) The well-known Jörgensen method, used in Denmark for many years, and (2) the more recent St. Gobain Method worked out in France by Terlet and Briau, and which was published originally in *Annales des Falsifications et des Fraudes* ('35, No. 323). Details of the two methods are given in *Superphosphate,* September, '36.

French Plant to Make Citric from Molasses

Foreign reports state that the Societe Sucriere du Calvados of Courseulles-sur-Mer, France, has received governmental permission to build a plant for the production of citric by the fermentation process from molasses and sugar syrup.

Japanese Experimental Low Pressure Methanol Process Offers Production Economies

By Takashi Egushi

DETAILS of an experimental Japanese low pressure process for synthetic methanol is reported to have possibilities of considerably cheapening costs of manufacture, according to a paper delivered at the International Chemical Engineering Congress in London a few months ago.

Author, Takashi Egushi, Japanese Naval Fuel Dept., stated that the characteristic features are employment of highly active catalysts which allow of operation at pressures as low as 100 atmospheres and of water-gas produced directly from coal in a special generator.

Water-Gas Directly from Coal Economically

During the past 7 years special efforts have been made, in the Naval Fuel Depot Laboratory to manufacture water-gas of good quality directly from coal economically. At the end of '34 the installation of an industrial plant was completed. In the complete gasification of coal, the blow-gas from the generator is used as fuel to drive a gas engine directly coupled with an electric generator. Power recovered from the blow-gas roughly equals the total amount of electric power required for the plant; for example, 600 kw.-hr. can be obtained per 1,000 cub. m. of water-gas. Tar, the by-product of the generator, is easily burned with a simple burner, together with other fuel under the boiler. Altogether, 100 tons of coal for the gas generator and 45 tons of inferior coal for steam raising will produce 16 tons of methanol of high purity.

Ingenuity was exercised to obtain water-gas of high quality by gasifying coal in a simple apparatus, but Takashi Namikawa finally developed a twin generator, which consists of two sets of ordinary gas producers by which water-gas of the same quality as that obtained from coke, is easily obtained. To diminish the difficulties which are apt to occur in the generator, the coal should be in small pieces, and have suitable caking power and high melting-point.

The generator is completely closed, so that the ash which accumulates at the bottom during operation is withdrawn automatically into the ash chamber by slowly revolving a turntable at the bottom by means of a friction gear. Cleaning apparatus for the water-gas consists of a centrifugal dust catcher, hydraulic main, water scrubber and wet and dry desulfurizers. To overcome the difficulty of removing the tar, electrostatic precipitation was adopted, the Cottrell "detarrer" being used. While the untreated gas before entering the detarrer is laden with 12 grams of tarry matter per cu. m. besides much water fog, the exit gas from the detarrer has only 0.05 gram of tar in the same volume of gas, and it leaves only a slight yellow spot on a sheet of white paper when the gas is blown against it through a nozzle.

Actual Operating Costs

Actual operating cost involves the expense for power, maintenance and labor, but the two latter factors are negligible. Total electric power consumption is about 1.2 kw.-hr. per 1,000 cu. m. of treated gas at ordinary temperature when treating 5,000 cu. m. per hour.

From theoretical considerations it appears that the conditions for methanol synthesis are most favorable when the hydrogen-content is twice that of the carbon monoxide in the gas, but in industrial practice excess of hydrogen is frequently employed for several reasons. In this modified Japanese process, to adjust the composition of the water-gas, partial conversion of CO by treatment with steam is adopted, and the whole gas is treated on the catalyst with a closely regulated amount of superheated steam in the converter. Special devices are used to remove from the gas the constituents that have deleterious effects on the catalyst used. For example, the purified gas, before entering the reactor, has only 1 gram of sulfur per 1,000 cu. m. at ordinary temperature and pressure.

Effect of temperature on the maximum possible yield is far greater than in the case of ammonia equilibrium. Therefore, a reduction of working temperature is very desirable in the methanol synthesis. Fortunately, a catalyst has been prepared which can be used at as low a temperature as 230° C. There is thus no need of pressures higher than about 100 atmospheres to obtain a reasonable yield of methanol.

Reaction vessel is made of ordinary nickel-chrome steel tube having flanges and caps at both ends. It is lined with copper plate internally, and in it a preheater, a heat exchanger, and catalyst holders are placed. External heating and cooling devices are also provided. Each reactor is provided with a water cooler and a receiver, in which the liquefied methanol is separated from the unconverted gas under pressure, and the methanol is drawn off continuously through a valve.

It is necessary at the start to warm up the reactor by means of electrical heat, to reduce the catalyst with pure hydrogen under ordinary pressure, and to bring the catalyst to the reaction temperature. When the catalyst temperature reaches 230°, a sharp rise in temperature appears under 80 atmospheres. Further heating is dispensed with during the operation, as in ammonia synthesis. Temperature control by external forced-air cooling is indispensable, especially when the reaction takes place vigorously.

Several trial runs were made on the production of methanol, using this special catalyst under the above conditions, and the conversion rates of the gas to methanol reached from 20 to 30% with a single passage at a space velocity of 10,000 at normal temperature and pressure. Under these conditions, the space-time yield of methanol amounts to 0.6-1.3 kilogs per hour per liter of catalyst. Percentage volume of the gas converted to methanol amounts to about 60-70% when the gas is passed through the reaction tubes in series without recirculating pumps, formation of CO_2 and CH_4 due to side reactions being negligible.

Life of the Catalyst

Life of the catalyst depends mainly upon the degree of the purification of the crude gas. Effect of heat on the catalyst life is comparatively small in this low-temperature process if the reaction temperature is well controlled. For instance, the initial rate of methanol yield lasted without any notable decrease over a month.

Crude methanol obtained from the reaction vessels, excepting the one at the beginning of the operation, is a colorless transparent liquid with a faint, fruit-like, agreeable odor, containing a trace of metallic substances, higher alcohols, hydrocarbons, aldehydes, ketones, acids and water. Approximate purity is shown to be from 95 to 97% by specific gravity determination and distillation, so there is no need of complicated purification, and rectification through an ordinary distillation column suffices to purify the methanol.

Several reports concerning the toxicity of methanol have been published, but the results are somewhat conflicting. It is interesting to note that refined methanol obtained as above seems to be not so poisonous to mice as has been reported, and a single large dose was less toxic than ethyl alcohol in preliminary experiments. Digested in British, *The Chemical Trade Journal*, Oct. 30th, p359.

Obtaining Best Results from Control Instruments

Although excellent results are being obtained in many automatic control installations at the present time, it is certain that some are not working to the highest degree of efficiency of which they are capable. It is the general experience of those who are called upon to "service" automatic controls that the troubles due to errors in their installation or fitting probably exceed those due to bad design or the wrong choice of type for the particular purpose in view. Consideration should be given to some of the matters which affect results, and the pitfalls which may beset those responsible for installing or supervising the installation.

Of the various functions in industry which are automatically controlled, those of temperature, humidity and pressure are the most common.

Factors which apart from the design of the control apparatus have a bearing on the successful working of any automatic control installation may be classified as follows: (1) Local conditions surrounding the instruments themselves. (2) Plant characteristics. (3) The sensitive element, or, in the case of pressure controls, the pressure connection; its type, location and protection. (4) The effect of the quality of the installation work in general.

The average instrument maker does not expect his product to be housed under museum conditions, but he does not agree with the "treat 'em rough" policy, which is said to be so beneficial in other spheres. His problem is, in some respects, an economic one; unless he is making an instrument for one particular application, he hopes that his product will find its way into many different kinds of works and factories involving a great variety of conditions. He accordingly proceeds to visualize every conceivable adverse condition, such as corrosive fumes, dust, dripping oil and water, escaping steam, vibration and every extreme of weather condition. When a control installation is to be installed, therefore, it is evident that it is worth a little thought to find a clean and accessible spot in which to mount the "brains" of the apparatus.

If, as is often the case in chemical plants, there is likely to be corrosion or other enemy to contend with, great mutual advantage will be secured if the user will let the instrument maker have the fullest details and any suggestions which experience has shown to be good, especially with regard to materials or finishes which have been found successfully to withstand the conditions. If the instruments embody open electrical contacts of any type it is vital that there shall be no risk of contamination of the contact surfaces with consequent unreliability of operation.

Author, Douglas W. Harrison, in paper before the Chemical Engineering Group, University College, London, England, reviewed the various factors that should be considered in the arrangement, location of control instruments. Digested from British, *The Chemical Age*, Oct. 31, '36, p369.

Use of Cleaner Coal Suggested in Plants

Use of cleaner coal rather than costly installations of dust-collecting devices in chimneys of industrial plants is the answer to the problem of overcoming this nuisance, according to a paper by A. T. Barber and T. F. Hurley of the Fuel Research Station delivered before the British Smoke Abatement Society's annual conference, held at the Science Museum, South Kensington. Emission of dust is to some extent preventable by the use of cleaned coals.

Propylene Oxide Production by New Method

Propylene oxide is produced, according to details in English Patent 451,130, controlled by Soc. Francaise de Catalyse Generalisee, Courbevoie, Seine, France, from a mixture of propylene, oxygen, and a diluent at a temperature above 200° C. by contact with silver containing small quantities of gold and/or copper. Temperature may be 300-375° C. In examples, (1) propylene, air, and carbon dioxide are employed, the propylene oxide being absorbed in active carbon or dissolved in water; (2) same process is effected at 50 atmospheres pressure; (3) propylene, air, and steam are employed; (4) colloidal silver containing a small proportion of gold and/or copper is placed in a high-pressure tube full of water, propylene being pumped in to dissolve in the water; tube is then heated to 300-375° C. and air is forced in.

Steps in Concentrating Nitric Acid

Concentrated nitric acid is obtained from dilute nitric by the following steps: (1) Reacting diluted nitric acid with nitric oxide obtained in the second step to produce nitrogen tetroxide and water; (2) dissociating a portion of the nitrogen tetroxide obtained in the first step into nitric oxide which is employed in the first step and oxygen; (3) the reaction of the remainder of the nitrogen tetroxide from the first step with oxygen from the second step in the presence of water to produce concentrated nitric acid. In an example, 50% nitric acid from ammonia oxidation absorption flows into a packed absorption tower, provided with temperature regulating coolers, hot dissociated gases from the bottom of a dissociation furnace entering the bottom of the tower. Water containing a little undecomposed acid leaves through a pipe, while part of the gases enriched with nitrogen tetroxide are removed through another pipe by means of an injector, and are decomposed in a furnace for return to the tower. Excess of gases containing NO_2 and oxygen together with water vapor and nitric acid are withdrawn by means of a vacuum pump which maintains a pressure of about 0.1 atmosphere in the circulation system. A part of the withdrawn gases is forced under pressure into an injector, while the remainder enters a cooler. A condensate of 60-70% nitric acid separates in the cooler, and is led with the uncondensed gases into a pump which pumps them at a pressure of 20-50 atmospheres into a pressure column. Components react in this column to produce 98% nitric acid, while uncondensed gases are returned to the system. English Patent 447,952, Hydro Nitro Soc. Anon., Geneva, Switzerland, digested British, *The Chemical Trade Journal.*

Treatment of Phosphorous Burns

Improved method for treating phosphorous burns consists of bathing wounds in lukewarm 3% sodium carbonate or 5% sodium bicarbonate solution. Wounds should not be left for a long time continuously in an alkaline bath, but should be removed frequently and left for brief periods in contact with the air. After several alternations the burn is then further treated in the usual manner. *The Manufacturing Chemist,* British, October, p352.

Oil Molecules Flexible

Oil films so thin that a mere ounce of oil would cover a fifteen to twenty acre pond have been produced with a new polymolecular apparatus devised by Drs. W. D. Harkins and Robert J. Myers, University of Chicago, according to newspaper reports. Lying-down molecules of an ounce of oil will cover 15 to 20 acres while upright molecule films will cover only 3½ acres of water surface. Experiments are expected to throw new light on films used in lubrication, paint, printing, medicine and biology.

Industrial Waste Survey in New Jersey

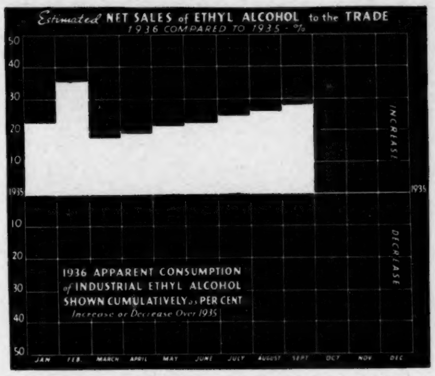
An industrial waste survey was made covering the most highly industrialized area of New Jersey. Using as units the employees of each industry, the results were integrated and estimates made for the entire waste production of the state. The quantities of wet sludge produced by the industries amounted to 700,000 tons a year, as compared to 900,000 tons of sewage sludge. The settleable solids amounted to nearly 100,000 tons a year as compared with 450,000 tons of sewage sludge. The estimated "population equivalents" for the industries amounted to over 300,000 tons or about two-thirds of the total domestic waste produced by the entire population of the state. William Rudolfs, N. J. Agricultural Experiment Station,

Prepared Monthly by the U. S. Industrial Chemical Co., Inc.

SOLVENT NEWS

Reg. U. S. Pat. Off.

December ★ A Monthly Series of Articles for Chemists and Executives of the Solvent-Consuming Industries ★ 1936



Apparent consumption of industrial ethyl alcohol from Jan. 1 to Sept. 31, 1936 was 44,578,000 wine gallons. This is 27.5 per cent greater than during the same period in 1935 when 34,956,000 wine gallons were consumed.

PASTEL SHADES PROMINENT ON '37 CARS AT AUTO SHOW

Mecca for new car buyers, the 1936 National Auto Show opened at Grand Central Palace. New York, on November 11th, amid the fanfare of increased buying activity. Again streamlining continued to have a major influence on color trends.

Luxurious pastel shades found greater acceptance than heretofore, although a number of higher-priced cars in the "chauffeur class" were shown in black. The metallic iridescent finishes, so popular at the 1935 show, appeared to have lost some ground. Body stripings and secondary colors were less in evidence, manufacturers inclining to greater use of cleverly styled chromium plating and monotone color effects in their place. Even disc wheels exhibited larger areas of metallic plating.

STUDY EFFECT OF OXALIC ACID ON SHELLAC SOLUTIONS

Further studies on the action of oxalic acid in retarding the darkening of shellac solutions in metallic containers have apparently established a relationship between the electric conductivity of such solutions and the amount of oxalic acid to be used.

Experiments on 20 per cent solutions of TN shellac in 98 per cent alcohol led to the observation that for a certain oxalic acid concentration, (usually between 0.04 per cent and 0.2 per cent) there was a conductivity minimum.

No direct relationship between darkening and the point of minimum conductivity was noted. However, it seemed apparent that the maximum bleaching effect of oxalic acid very nearly coincided with the point of minimum conductivity. In actual practice this would mean that concentrations of oxalic acid below 0.25 per cent are the optimum amounts to be used.

By way of explaining the observed phenomena, it has been suggested that ionization of the dissolved calcium and iron salts imparts a certain conductivity to the shellac solution. Adding oxalic acid precipitates these salts as insoluble oxalates and the conductivity is decreased upon addition of the optimum quantity of acid.

NITROCELLULOSE LACQUERS MAKE NEW GAINS IN RUBBER INDUSTRY

Changes in Rubber Compounding Technic Increase the Demand for "Tailor-Made" Lacquers

New achievements high-light the progress of lacquers in the rubber field. A lacquer film which will stretch 200-300 per cent was introduced to the rubber industry some months ago. Lacquer coated cables which will stand immersion in a bath of hot oil for forty hours at 220° F. and then bend around a one-half inch mandrel without cracking the finish are commercial products. From children's alphabet blocks to hot water bottles and galoshes, lacquers are important factors in marketing rubber products.

The use of lacquers in rubber is not new. For many years this type of coating has been recognized as a first line of defense against oxidation, dirt, water, gasoline, oils, and electrical corona. Beside their protective functions, colored lacquers have the obvious merit of glossing over and brightening drab-colored rubber stocks such as dolls. Rubber coated textiles are more pleasant to touch because of the smooth, non-tacky finish provided by the lacquer. To a large extent, the popularity of nitrocellulose lacquer in this field is due to its quick-drying and wide adaptability.

Unique Requirements

Many special requirements were presented; lacquers had to be "tailor-made." A lacquer perfectly satisfactory for the most flexible sheet of metal was far too brittle and non-extensible for rubber. Wetting of the rubber itself and subsequent adhesion of the lacquer film are major problems. But by far more unique to the use of lacquers in this field, are

(Continued on next page)

VICE-PRES. BACKUS MARKS HIS 20TH YEAR WITH U.S.I.

Arthur A. Backus, Vice-President in charge of Production of the U. S. Industrial Alcohol Co. and the U. S. Industrial Chemical Co., Inc. has just completed his twentieth consecutive year of service with U.S.I.

Beginning as research chemist, he became in turn, Research Director, Production Manager and Vice-President in Charge of Production.

Among the developments to which Mr. Backus has contributed is the process for producing esters from dilute acids (e. g., ethyl acetate from vinegar). The purification of Carbon Dioxide from fermentation of molasses occupied his early efforts to find uses for the by-products of alcohol manufacture. As a result of his endeavors this gas is now widely used in carbonated beverages.

He has been responsible for many innovations and improvements in the design of distillation equipment. During the past three years he has directed an extensive program of plant rehabilitation and modernization for U. S. I.

Pictures, Inc.

FLESH-COLORED LACQUER is sprayed on doll heads as shown above. The rosy cheeks of the doll are produced by spot touching the cheeks with a bright red lacquer previous to applying the flesh coat. This spot lacquer bleeds through to produce the desired shade. Eyebrows and lips are hand painted. Above is one of the spray booths at the Long Island City plant of the Ideal Novelty & Toy Co.

DECEMBER ★ **SOLVENT NEWS** ★ 1936

SOLVENT NEWS

BY-PRODUCT SOLVENT OILS FROM COKE SHOW PROMISE

High-boiling oils reported to possess excellent solvent properties have been recovered from residues of by-product coke plants. It is stated that the oils, largely aromatic hydrocarbons, can be produced in large quantities at low cost. They are solvents for rosin, resinates, many natural gums, synthetic resins, rubber and chlorinated rubber.

These oils are said to have the following characteristics: Boiling range: between 180° C. and 375° C. Specific gravity: 0.950 to 1.030 at 15.5° C. Corrosion: negative by copper strip test. Acid number: 0.1. They are miscible with most of the commercial organic solvents and are not affected by water, lime, alkalies, or dilute acids.

Possible applications for the new oils include such fields as paint, varnish and lacquer manufacture, wood preservatives, insecticides and fungicides, cleaning agents, floorings, and asphalt.

LACQUERS GAIN IN RUBBER FIELD

(Continued from preceding page)

requirements for resistance to the ingredients used in rubber items.

It is common practice to apply lacquers to many rubber articles before vulcanization, since there is often a gain in adhesion when this is done. This involves coating rubber which may be compounded with such diverse chemicals as sulphur, stearic acid, hydrocarbon softeners, pigments, and organic accelerators and anti-oxidants. Vulcanization may be under steam pressure at temperatures from 240° to 250° F. Under these conditions certain compounding ingredients may bloom out of the rubber with adverse effects on the lacquer.

Needless to say, the conventional nitrocellulose lacquer will not meet these requirements. Nitrocellulose tends to break down above 200° F. and plasticizers may be decomposed or driven off. Yet by proper formulation, nitrocellulose lacquers have been developed to meet these and tests even more severe. Nitrocellulose coated cables are now so made that when ignited they will extinguish themselves.

Formulation of lacquers which allow for unusual stretch has been effected by a clever compromise. Lacquer films are made to crack with invisible hairlines so that the lacquer between these microscopic breaks lies perfectly flat and retains good adhesion. Thus have been developed films which possess the characteristics necessary to compensate for the great disparity between the elasticity of the rubber and the film itself.

Application of lacquers to rubber is by dipping, brushing, spreading or spraying either before or after vulcanization. The kind of article, size and shape determine the method.

The perfect lacquer for rubber has not yet been produced and changes in rubber compounding practice herald the need for new lacquers. Still other types of rubber articles could utilize lacquer, leading up to a potentially greater field.

Railroads Use Super Pyro To Protect Air Cylinders

Railroad travel is made safer during the winter season through the use of Super Pyro. Last winter a number of Eastern railroads applied a quart of U. S. I.'s money-saving anti-freeze to locomotive air reverse cylinders and valves which have a tendency to "freeze-up" in cold weather. Just as in automobiles, this application of Super Pyro calls upon its ability to prevent rust and corrosion as well as to provide anti-freeze protection.

Standard practice is to blow out the Super Pyro after every ten hours of use, since moisture from the compressed air dilutes the alcohol. Loss due to operation of the gear also makes regular replacement necessary.

Transparent covering has been applied to such unrelated products as citrus fruits, cigarettes, tools and photographs by a cold dip process developed recently. The discoverer states that it may be colored, is waterproof and transparent, and can possibly be made fireproof.

Rolf Stein of Honeywill & Stein, Ltd., selling organization for Great Britain's largest alcohol and solvent producers, has just completed a two-month visit to this country. At the end of his stay, during which he visited the Baltimore plant of U. S. I., Mr. Stein said that British chemists should visit the United States more often to keep abreast with the latest developments.

TECHNICAL DEVELOPMENTS

The items in this column are gathered from many varied sources. Further information may be obtained by writing to U. S. I.

U S I

Collapsible tubes which require no screw caps or other closures are on the market. Materials which may use the new package include: colors in oil, japan driers, putties, plastic compositions and wood fillers. The neck of the tube is sealed by a slotted flexible diaphragm. Pressure on the tube causes the slot to open and the contents to flow out.

U S I

Rubber can be vulcanized direct to metal by a new simplified process recently developed. Flexible rubber-metal couplings, non-skid wheels, power pulleys and rolls are some of the forms which have been developed.

U S I

A 2-dip solvent degreasing machine for both immersion and vapor cleaning has recently been placed on the market. The work to be cleaned is usually immersed in a boiling chamber first, then cooled in a clean solvent rinse and finally suspended for a few seconds in pure solvent vapors.

U S I

A protective coating formulated with minute flakes of metallic copper in a liquid vehicle has been marketed. It is said to dry to a coating of pure metallic copper that is corrosion-proof, water-proof and fire resisting. The manufacturer states that it can be applied to metal, wood and concrete.

U S I

Photographs may be printed directly on such surfaces as rubber, fabrics and leather by a new process, according to reports. The results are said to be permanent and washable.

U S I

A process for casting rubber into various useful forms has been introduced into this country from England. A highly concentrated form of latex is mixed with a setting chemical and almost any compounding ingredients such as dyes, pigments, anti-oxidants and vulcanizing agents.

U S I

Measurement of both diffused and refracted light is the feature of a new photo-electric cell. The instrument, which is portable, may be applied directly to an enameled or lacquered surface. Readings can be made in absolute or comparative units.

Charts illustrating a simple method for determining the contents of 54-gal. drums by stick measurements may be secured by writing to U. S. I.

New Brunswick, N. J., *Industrial & Engineering Chemistry*, Vol. 28, No. 11, p1294.

A Cadmium Poisoning Reported

Death of a worker in a cadmium smelting plant is reported in the foreign trade journals. Plant is located at Vasby, near Stockholm, Sweden. Symptoms of the man's illness indicated influenza but a post-mortem examination disclosed minute cadmium particles in the brain and lung tissues. Zinc smelters have their special illness, a fever which up to now has been difficult to explain. It is suggested that the occupational disease of zinc smelters may in reality be cadmium poisoning. *The Chemical Age* (British), Oct. 24th, p319.

Non-Sparking Tools in Chemical Plants

A number of plant safety engineers give their views on the use of non-sparking tools, particularly in industries where flammable gases or vapors are encountered. Specific applications are discussed by several who contributed to the symposium. *Chemical & Metallurgical Engineering*, November, '36, p604.

Electrolytic Oxidation of Arsenious Oxide

The electrolytic oxidation of arsenious oxide to arsenic oxide in a sodium hydroxide solution using iron electrodes has previously been investigated by S. J. Lloyd and A. M. Kenney in the U. S., as well as by O. A. Essin of Germany, all of whom report that approximately 85% of the arsenious oxide is oxidized.

Prof. O. W. Brown, J. E. Hatfield and J. M. Church, of Indiana University, have studied the influence of anodic materials, nature of electrolyte, variations in anodic current density, and concentration of arsenious oxide in the electrolyte. Work was described in a paper (Preprint 70-2) delivered before the Electrochemical Society at its Niagara Falls meeting in October.

In all the experiments, the cathode chamber consisted of a clay, porous cup containing an iron wire gauze cathode. This cup was 10 cm. high, 4.5 cm. inside diameter, and had a capacity of 100 cc. In those experiments in which a platinum anode was used, the cup was suspended in a 400 cc. beaker (10.5 cm. high and 7 cm. in diameter) in which the anode and anodic solutions were placed. In the experiments using Acheson graphite anodes, cup was suspended in a 600 cc. beaker (12 cm. high and 8.5 cm. in diameter). Two hundred cc. of anode solution and 90 cc. of cathode solution were used throughout all the work.

Amount of arsenious oxide used in the anodic solution before and after oxidation was determined by the titration of a sample against decinormal iodine solution. Arsenious oxide used in all the experiments was 99.5% pure.

A series of tests was conducted, using a platinum anode and varying the concentration of arsenious oxide, to determine the concentration at which the maximum current efficiency would be obtained. Results show that from 2 to 9.5% As_2O_3, a peak efficiency of 90% was reached when the anode solution concentration of As_2O_3 was 4.5%. A range of current densities (2 to 8 amp./dm.^{2}) was tried, using 8 grams of As_2O_3 in 200 cc. of 10% NaOH solution with a platinum anode. There was no perceptible difference in current efficiency at any of the current densities tried. An electrolyte composed of 0.5 gram Na_2CO_3, 2 grams $NaHCO_3$ and 7.04 grams of As_2O_3 dissolved in 200 cc. of 5% NaOH solution, which was then neutralized to a phenolphthalein end point with HCl was found to give the highest current efficiency of any of the various electrolytes investigated. Platinum and Acheson graphite anodes were tried in all of these tests. Using the electrolyte just described, highest efficiency obtained was 77.4 and 97.5% respectively for the platinum and Acheson graphite anodes.

Tests on the effect of the concentration of arsenious oxide in the anode liquor using an Acheson graphite anode were also made. Anolyte used in these tests was composed of 0.5 gram Na_2CO_3, 2 grams $NaHCO_3$, and increasing amounts of As_2O_3 dissolved in 200 cc. of 5% NaOH solution, which was then neutralized to phenolphthalein end point with HCl. As the concentration of As_2O_3 in the solution increased, the current efficiency increased until a 100% efficiency was attained with an 8% As_2O_3 concentration in the anode liquor.

Menthol from a By-Product of Camphor

Synthetic menthol from a by-product of camphor extraction is reported by the Formosa State Experiment Station. An experimental plant is being built.

Removal of Salt from Caustic

The short article appearing in this section in November, page 493, entitled "Removal of Salt in Caustic Production," stated that the developments discussed were the result of research work on the part of chemists of the Pennsylvania Salt Mfg. Co., but inadvertently failed to mention that the process was protected by U. S. and foreign patents owned by this company.

Improved Hydrogen Peroxide Process

The intermediate production of ammonium persulfate or persulfuric acid is an improvement in the method of manufacture of electrolytic hydrogen peroxide perfected by the N. V. Industrielle Mj. vorrheen Noury and Van der Lande, Deventer, Holland. The persulfate solution is decomposed by subjecting it to the action of direct steam, superheated to 300°-600° C.

By such a method both the rapidity of the hydrolysis and the rapidity of the elimination of the hydrogen peroxide from the reaction mixture may be considerably increased. It is noted, as an unexpected fact, that by the use of this very high steam temperature larger losses of active oxygen do not arise, although persulfates, persulfuric acid, Caro's acid and hydrogen peroxide all quickly decompose at increased temperature.

Among the several installations of large multiple effect water stills recently designed and built by the F. J. Stokes Machine Co., Philadelphia, is that of the still shown in the illustration ready for shipment to a large pharmaceutical manufacturer. This still has a capacity of 400 gals. per hour and the distillate tests well within U.S.P. requirements. To maintain this standard the still is equipped with special centrifugal baffles and all surfaces in contact with the distillate are lined with pure block tin. Specifications on another similar still required an hourly capacity of 500 gals.; the distillate to contain less than 1 part of chlorine in 10 million, while yet another was designed to deliver 750 gallons per hour with less than 3 to 5 parts of solid matter per million.

Of interest is the fact that one of these stills—designed to operate on a steam pressure of 185 lbs.—required a steam chest built of the thickest piece of copper plate ever rolled in Philadelphia.

Further advantages claimed are: (1) Hydrolysis takes place so quickly that a smaller reaction space than usual is sufficient. (2) Heat that is required for the reaction may be supplied with a relatively small quantity of steam so that accordingly the hydrogen peroxide may be directly obtained in a concentrated form.

Process is preferably carried out in a quartz apparatus. Although heating agents with a temperature lying between 300° and 600° C. may be applied, preferably use is made of temperatures above 450° C. It is necessary to carry out the reaction under decreased pressure. Pressure in the apparatus, measured at the point where the gases and the liquid come out, may vary between 1 and 10 cm. of mercury.

The ammonium-persulfate concentration may lie between 100-250 grams per liter, sulfuric acid content between 200-900 grams per liter, and ammonium sulfate concentration between 0-400 grams per liter. In using persulfuric acid solutions, the concentration may lie between 100 and 300 grams per liter, while the sulfuric concentration can be 150-250 grams H_2SO_4 per liter. English Patent 454,209 ('35).

Manufacture of Antimony Sulfide Pigments

Commercial antimony sulfide pigments are classified: the pentasulfide with 7-9% of free sulfur, the pentasulfide with 15-17% free sulfur and 35-37% of calcium sulfide, and, finally, the oxysulfide or antimony crimson.

First of these is made by the addition of acid to a sulfoantimoniate. The free sulfoantimonic acid first formed decomposes into antimony pentasulfide which precipitates, and hydrogen sulfide which is evolved. Most suitable raw material is Schlippe's salt in a well-crystallized and pure form. Hydrogen sulfide evolved is absorbed by a solution of caustic soda, the process being a cyclic one, since the Schlippe's salt is made by the reaction between sodium sulfide, antimony trisulfide, and sulfur. Color of the precipitate depends upon the degree of acidity of the solution: higher the acidity, the darker the color of the precipitate. Precipitation should be effected in the cold by pouring the sulfoantimoniate solution into the acid.

In the manufacture of antimony pentasulfide of the second type, calcium sulfoantimoniate is employed. This latter is made by boiling a mixture of water, lime, sulfur and antimony trisulfide.

Antimony crimson is produced, theoretically, by treating antimony trichloride with a solution of sodium thiosulfate. In practice, it is better to use a hydrochloric acid solution of antimony trichloride, the acidity preventing the formation of secondary reactions by the hydrolysis of the trichloride. Solution is readily obtained by treating native antimony trisulfide, or antimony trioxide, with concentrated hot hydrochloric acid. In the precipitation of the solution with sodium thiosulfate, calcium carbonate is also added to neutralize the acidity. Precipitate first formed is yellow, but slowly changes to orange and carmine red. Reaction is favored by heat. A. Chiappero, *Chim. et Ind.*, August, '36.

Cleaning Aluminum Equipment

Wherever possible, aluminum apparatus should be cleaned by wiping when it has been left unused for any length of time. Thin films of water become highly charged with oxygen. Dried films are frequently even more aggressive than many of the solutions handled in the apparatus.

It may often happen that, during the use of aluminum vessels, hard deposits are formed on the walls, and must be removed from time to time. Such deposits are dissolved most rapidly by dilute hydrochloric acid, to which components which immunize the aluminum have been added. Such additions have been placed on the market, for instance, by I. G., under the name "Sparbeize 20." A substance which almost entirely suspends, in this way, the action of hydrochloric acid on aluminum is dibenzylsulfate. H. Röhrig in a paper before London International Meeting of Chemical Engineers, given in detail, *The Chemical Trade Journal*, Nov. 20th, p429.

Booklets & Catalogs

Late for Classification Last Month

B142. Surface Combustion Corp., Toledo. New booklet provides an insight into the far-reaching operations and services of this company. "Wherever Heat Is Used in Industry" is heavily illustrated with recent installations of the company's heating equipment.

B143. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Booklet B.2063 illustrates many of the industrial applications of Micarta, a plastic laminated material available in many grades and shapes.

B144. Phoenix Metal Cap Co., 2444 W. 16th st., Chicago. *Phoenix Flame* for October is the Chinese Number. This outstanding company monthly house-organ is most entertaining and the photography (illustrating latest containers with Phoenix caps) is strictly in a class by itself.

Chemicals

B145. American Cyanamid Co., 30 Rockefeller Center, N. Y. City. The November-December issue of American Hortigraphs is ready for mailing. For the benefit of new C.I. readers we report that this is a highly valuable abstract service of the latest developments in fertilizer doings, with emphasis, of course, on the part cyanamid is playing.

B146. The Bakelite Corp., 247 Park ave., N. Y. City. Technical Bulletin No. 15 deals with technical data on linseed and perilla oil in Bakelite resin fortified finishes.

B147. Barclay Chemical Co., 75 Varick st., N. Y. City. This company has been appointed selling agents in this country for colloidal graphite produced by Econoil Products, Ltd., Cardiff, Wales. Booklet briefly describes the applications of this material.

B148. The Celluloid Corp., 10 E. 40th st., N. Y. City. A 24-page booklet which describes the development in the plastics field of injection molding with thermoplastics. Booklet gives the properties of Lumarith.

B149. Commercial Solvents Corp., Terre Haute, Ind. *Alcohol Talks* for October deals entertainingly on the subject of alcohol's place in the flavoring industries.

B150. Detergent Products Corp., Atlanta, Ga. A new booklet "Solutions for your Problems by the Use of Depurator and Neutralite Products," deals with textile detergents problems in a very novel and instructive way.

B151. Detergent Products Corp., Atlanta, Ga. A very unusually written booklet on the subject of textile detergents. Contains valuable tables on measuring pH; capacity of rectangular tanks and cylindrical tanks.

B152. The Dicalite Co., 120 Wall st., N. Y. City. New booklet describes the advantages of using Dicalite, an inert filler, in paint products. Pamphlet is well illustrated through photomicrographic studies. Physical and chemical properties of Dicalite are supplied.

B153. Eastman Kodak Co., Rochester, N. Y. Synthetic Organic Chemicals for November is largely given over to a discussion of "The Role of Free Radicals In Organic Chemistry," by T. F. Murray, Jr., of the Eastman "labs."

B154. Electro Bleaching Gas Co., 60 E. 42nd st., N. Y. City. *The Pioneer* for October features an article on paper. It is really a history of the industry and will be published in installments.

B155. Fritzsche Brothers, Inc., 76 Ninth ave., N. Y. City. November price list of essential oils, aromatic chemicals, etc., of value to the chemical specialty manufacturer.

B156. Grasselli Chemicals Dept., E. I. du Pont de Nemours & Co., Wilmington, Del. A new leaflet is available on "Cadalyte"—a process and product for cadmium plating.

B157. Grasselli Chemicals Dept., E. I. du Pont de Nemours & Co., Wilmington, Del. The latest service bulletin for the electroplating trades is devoted to a listing of the varied chemicals and equipment marketed by Grasselli.

B158. Grasselli Chemicals Dept., E. I. du Pont de Nemours & Co., Wilmington, Del. "Zin-O-Lyte" is a new booklet which describes in detail the new zinc-molybdenum process of electroplating.

B159. The Grasselli Chemicals Dept., E. I. du Pont de Nemours & Co., Wilmington, Del. New booklet describes the services and products produced for the cleaning and finishing of metals.

B160. D. W. Haering & Co., 3408 Monroe st., Chicago. *H-O-H Lighthouse* is a monthly publication devoted to problems in water treatment.

B161. Hercules Powder Co., Wilmington, Del., Cellulose Products Dept. A technical booklet to serve as a guide to users and prospective users of cellulose acetate.

B162. Merck & Co., Rahway, N. J. November price list.

B163. Monsanto Chemical Co., St. Louis, Mo. *Monsanto Current Events* for October contains the following feature articles: "Alcohol in Industry," by Paul O. Huntington; "The Services of Wood to Man Aided by Chemistry," by Ira Hatfield; and, of course, news of the various Monsanto plants.

B164. National Aniline & Chemical Co., 40 Rector st., N. Y. City. Dyestuffs for October features an article on Multi-color Effects on Skein Wool; reports on men and women's shoe and leather colors for Spring '37; colors for women's gloves; and several other instructive articles of interest to dyers and others in the textile field.

B165. National Oil Products Co., Inc., Harrison, N. J. Latest instructive booklet is one on "The Boiling Off, Dyeing, and Finishing of Rayon and Silk Fabrics," with specific applications of Nopco products. Written in a semi-technical manner.

B166. Pennsylvania Salt Mfg. Co., Widener Bldg., Philadelphia, Pa. An entirely new booklet is available on anhydrous and aqua ammonias. Contains a wealth of practical information for users of these products.

B167. Prior Chemical Corp., 420 Lexington ave., N. Y. City. A monthly called *Priorities*; for November it features "Chromium, Its Sources and Industrial Applications"; also thumb-nail sketches of chemical trail blazers and what they discovered.

B168. Chas. H. Stone, Inc., Charlotte, N. C. This well-known Southern distributor and manufacturer has released a new booklet listing the products handled. It is just 10 years ago that Mr. Stone started the business which has expanded tremendously in that time. A short history of the company is given.

B169. Wishnick, Tumpeer, Inc., 295 Madison ave., N. Y. City. *Witcombings* is a monthly publication carrying a wide variety of new and instructive items of interest to consumers of chemicals. This issue contains a short defense and explanation of "Technical Sales Service," by C. R. Johnson of the Whitco technical dept.

Equipment

B170. Ajax Electrothermic Corp., Ajax Park, Trenton, N. J. Bulletin No. 10 supersedes Bulletin 7 devoted to detailed information on oscillator or spark-gap type converters and furnaces. Of special interest is a pressure governor which saves hydrogen. A new 60-lb. tilting furnace for melting non-ferrous and precious metals.

B171. Baldwin-Southwark Corp., Paschall Post Office, Philadelphia. This company commemorating its 100th anniversary has started a new organ, *Baldwin-Southwark*. The first issue is devoted to a detailed history of the development of the company and the contributions it has made to the mechanical advances. Company is a producer of hydraulic machinery, pumps, water-works equipment, diesel engines, and special equipment for the chemical and process industries.

B172. The Brown Instrument Co., Wayne & Roberts aves., Philadelphia, Pa. Catalog No. 6703 covers the complete line of Brown thermometers and pressure gauges—indicating, recording, and controlling—and enumerates the wide range of industries to which they are applicable. It describes the classes of Brown thermometers and pressure gauges, explains their outstanding constructional features in simple, non-technical language, and presents a detailed description of each instrument of the line.

B173. Gifford-Wood Co., Hudson, N. Y. This is one of the most complete brochures on material handling machinery that has come to this department's desk in a long time. Those charged with the solution of problems arising in the handling of bulk and package materials in the chemical and process industries will find it an invaluable guide. It is particularly well illustrated, contains a wealth of diagrams and technical data.

B174. Griscom-Russell Co., 285 Madison ave., N. Y. City. An exceptionally compact and effective storage tank oil heater with a unique heat transfer surface is described in a new bulletin which describes the patented design of heating elements employed in this heater, illustrates alternate methods of its application at storage and service tanks, loading wharves and platforms, chemical and gas plants, and concisely outlines its special advantages.

B175. August Guise & Son, 121 E. 24th st., N. Y. City. Do you have a water filtering problem? This company has prepared several booklets describing the various types of filters, filtering aids, and miscellaneous equipment produced. Kindly indicate in your request the specific problem being encountered.

B176. Ingersoll-Rand Co., Phillipsburg, N. J. Diesel engines are constantly finding wider fields of use and this large manufacturer has prepared a detailed catalog of Type S engines. Brochure is profusely illustrated.

B177. International Nickel Co., 67 Wall st., N. Y. City. *Inco*, Fall Edition, contains a valuable article on the intricate equipment problems that arise in oil well drilling.

B178. Johns-Manville, 22 E. 40th st., N. Y. City. *The Power Specialist* is a monthly publication filled with valuable information for those in charge of power development and also for the maintenance dept.

B179. Johns-Manville, N. Y. City. "Things You Should Know About Your Roof," is a 25-page booklet that will prove invaluable to the industrial maintenance engineer.

B180. Leeds & Northrup Co., 4934 Stenton ave., Philadelphia, Pa. of interest alike to power-plant executives, engineers and operating men, whether connected with central stations or with industrial plants, is a catalog-type broadside on "Power Plant Measuring Instruments, Telemeters and Automatic Controls." Equipments for many power-plant measurements and controls are shown and described in compact yet remarkably complete form. Specific applications are mentioned—in electrical generation and transmission, in steam generation and distribution, in hydro-power generation and in diesel power generation—in which these equipments are being used to safeguard operation and to effect operating economies.

B181. The N. J. Zinc Co., 160 Front st., N. Y. City. Company has just released a "Supplement to a Visual Report of Progress," which will bring readers up-to-date with the remarkable progress being made in the die casting industry.

B182. Patterson Foundry & Machine Co., East Liverpool, Ohio. Company has issued a very instructive article in booklet form on "Processing Kettles As Used For The Manufacture of Synthetic Resins and Varnish and In The Chemical and Food Industries," written by W. Mynard McConnell, chief chemical engineer of the company. This document should be placed in the hands of the general manager, superintendent, chief chemist and chief engineer of every chemical and processing plant.

B183. Patterson Foundry & Machine Co., East Liverpool, Ohio. A 4-page leaflet describes Patterson kettles for oil processing and other process work.

B184. Precision Scientific Co., 1750 N. Springfield ave., Chicago, Ill. Leaflet describes a new midget water still for laboratory work which should appeal to large numbers of technical workers. Also contains photographs and descriptions of the larger stills manufactured with capacities up to 250 gals. per hour.

B185. Roots-Connersville Blower Corp., Connersville, Ind. Bulletin 260-B11B is descriptive of Type "T" turbine pumps, which have been on the market several years; and while the basic operating principle remains the same, numerous refinements have been included to provide for increased durability and improved performance. An unusual arrangement of cuts in the center spread illustrates various driving arrangements which are available, as well as featuring two sectional views.

Chemical Industries,
P.O. Box 1405,
New Haven, Conn.

I would like to receive the following booklets; specify by number: ....

....
Name ....
Title ....
Company ....
Address ....

All information requested above *must* be given to receive attention.

Bulk Packaging, Handling, Shipping

Data Sheets on Liners

"Bulk Packaging" is a subject on which not a great deal of helpful information has been made available to buyers and packaging engineers. It is, however, a subject of very major importance to manufacturers and shippers of dozens of products—from aluminum powder, through fertilizers and foods, glue and dynamite, seeds and spices, to zinc concentrates. It is a highly specialized field, one in which each product requires individual study and handling.

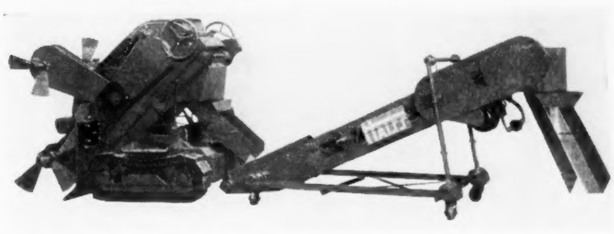
The Paper Service Co., Lockland, Cincinnati, Ohio, has prepared a series of "Data Sheets" covering the different materials manufactured such as bag and barrel liners and other packaging items. In preparing these sheets the packaging experts of the company have tried to make them more than just "advertisements" and to incorporate in them information which will be of help to buyers and packaging engineers in the selection of proper packages for their "bulk products". The story of each material or package is told briefly on the front of each sheet. On the back is given detailed information about that particular material and the requirements it is intended to meet. The sheets are of the correct size for filing and are on substantial stock so that they can be kept for reference.

Exact Weight Scale Issues Booklet

The Exact Weight Scale Co., Columbus, Ohio, has released a 32-page booklet, profusely illustrated, entitled "Industry At Work." Numerous installations of Exact Weight scales in various industries are shown.

Automatic Loading Machine

Here is an automatic digging and unloading machine, developed by George Haiss Manufacturing Co., 391 Canal Pl., Bronx, N. Y., for handling chemicals from storage bins, box cars, ship holds, stock piles, etc. In operating principle it follows



Equipment particularly well adapted to unloading bulk chemicals from box cars.

the manufacturer's line of portable loaders for general outdoor use, but has been designed to limit dimensions which adapt it to entirely new fields of usefulness.

Essentially it is a self-feeding portable bucket loader discharging onto the loading end of a portable conveyor of the type and dimensions required. Since box car unloading is a prime function, it has been made small enough to pass through a box car door. The machine illustrated is 7 ft. high, 5 ft. wide and 9 ft. long. Thus it will work in practically any storage space. Complete details and specifications are available.

Statistics on Drum Production

Operations (ratio to capacity) of the manufacturers of steel barrels and drums for September is reported at 51.5% by the Bureau of the Census. This compares with 38.1% in August of this year and 41.1% for September of last year. For the first 9 months of '36 the rate was 43.4%, compared with 35.7% in '35, and 37.6% in '34. Actual production in September of heavy types was reported to be 791,079 and shipments 787,380. Stocks at the end of the month were 32,125, unfilled orders, 513,581. Production of light types was 192,486 in September, shipments 193,257, stocks at the end of the month, 11,596, and unfilled orders, 250,960.

New Type of Moving Pipe Conveyor

A revolutionary departure in the design of conveyors—a moving pipe conveyor—has been introduced by the Johns Conveyor Corp., Newark, N. J. System employs what is, in effect, a moving rubber pipeline which travels with the material from the feed point to the discharge point. Any number of directional changes can be made. System will handle dry and wet solids, it is claimed by the manufacturer.

Expanded Storedoor Pickup and Delivery Service

Eastern railroads began an expanded storedoor pickup and delivery service on Nov. 16th, following authorization by the I.C.C.

Monel Metal Solves Corrosive Problems

Two new products designed to meet corrosive problems in a variety of plants where acid, alkali and other corrosive agents are encountered have just been announced. One of these is a Monel caster for trucks, hampers and wheeled conveyors of all kinds. Available in both the stationary and swivel roller type,

Pail of Monel Metal and a castor of the same material now available.

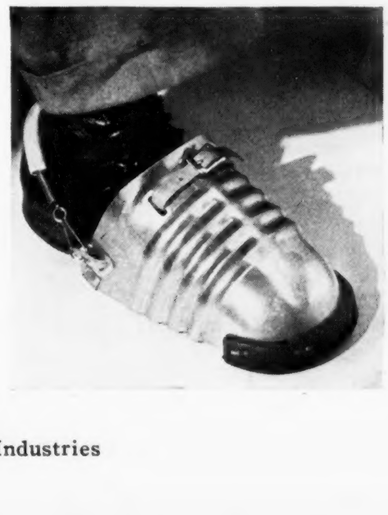
it is adapted to use in chemical, processing plants, laundries, dry cleaning and similar establishments where the corrosive materials are liable to spill over on the floor. Metal parts of the caster are entirely of Monel. Wheels are of a special rubber composition. Manufacturer is the Bassick Co., Bridgeport, Conn.

Second piece of equipment is designed for use in similar plants and is a special adaptation of an earlier piece of equipment. This is the Whitehead graduated type Monel pail, now made available in standard sizes of 12, 14 and 16 qts.

N. C. Issues Regulations for Acid Workers

Dept. of Labor of North Carolina rules that persons working in acid chambers or towers must wear gas masks and shall be equipped with rubber boots and rubber gloves. Workmen may not remain in chambers or towers for more than 30 minutes at a time, each such period to be followed by a 30-minute period in the open.

Foot Guards Prevent Foot Injuries

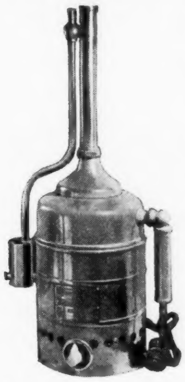


Foot injuries are all too common in chemical and process industries and many are the direct result of falling drums, carboys, etc., A novel safety device which easily slips over the plant worker's shoe is the safety foot guard illustrated. This equipment is manufactured by the Ellwood Safety Appliance Co., Ellwood City, Pa.

New Equipment

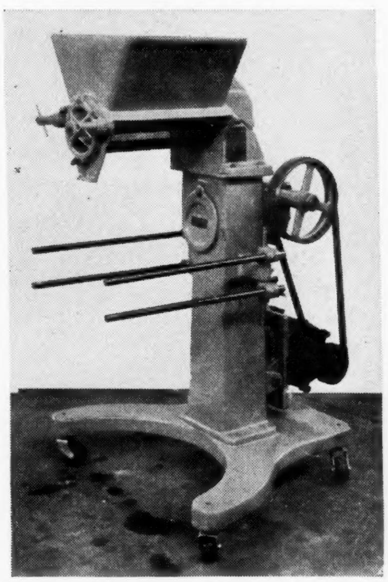
Midget Water Still · QC 403

A new midget water still producing one quart per hour of pure distilled water on only 800 watts current consumption has been placed on the market. It can be plugged into any standard electric outlet. The new model offers all of the approved principles of design that are incorporated in the larger models made by this company. After water and electricity are turned on the still operates automatically. It needs no permanent piping connections, since water supply and drain are adequately served with rubber tubing. Volatile gases such as carbon dioxide, chlorine, and ammonia are expelled through a screened vapor exit at the top of the long condensing column before the vapors are condensed, rendering the water gas free.



To Produce Uniform Granules QC 404

To meet the need in the chemical and process industries for a machine to produce uniform granules or nodules with a minimum of fine powder from damp products as well as dry materials—and particularly to facilitate uniform drying of filter cake clay and other damp masses one of the well-known equipment manufacturers has brought out a new machine known as the 43-A Oscillating Granulator. Machine also operates efficiently as a coarse grinder to break down into granular condition certain chemical powders, such as sodium hypochlorite, acetylsalicylic, Urea molding compounds and muriate of potash, which are fed to it in the form of slugs or cakes previously compressed on special tablet machines. Producing as it does a minimum of dusty powder, this machine lessens irritability, minimizes packing and caking in containers, and facilitates subsequent handling.



Machine is ruggedly constructed with large bronze-bushed bearings; is quiet, and is available in portable and dust-proof models. Granulating mechanism consists of a rotor of bars which oscillate backward and forward over a screen through which the material is forced. Screens are interchangeable and for heavy duty are made of piano wire or steel. Output ranges between 500 and 2000 lbs. per hour, depending on the material and the screen. This granulator is driven through a worm-and-gear running in oil, and is readily direct motor driven—as shown. Larger sizes are available.

Economical Laboratory Colloid Mill QC 405

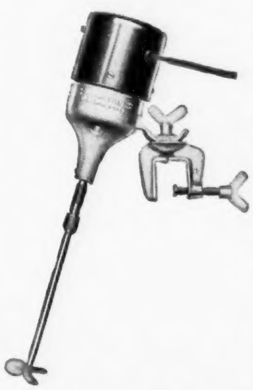
A new low-priced laboratory colloid mill is being marketed with overall dimensions 20 inches by 10 by 10, and with a weight of only 110 lbs. It is suitable for making emulsions and dispersions of small particle size and extreme stability, such as foods, for making fine lubricants, polishes, textile and leather finishes, latex dispersions, grinding and dispersing pigments, colors, resins, for insecticides, etc. It has an adjustable cap, is water cooled, non-foaming, has a non-sizing rotor, and is easily cleaned. Available in several different metals and alloys.

Improved Respirator QC 406

A newly improved respirator features a greatly enlarged area in its double filter chambers. Filter aperture for both pads of more than 24 sq. in. Dead air space has been cut to an absolute minimum. It is called Bulb Valve type No. 24 and has been approved by the Bureau of Mines No. BM 2111, for use in type "A" or Pneumoconiosis Producing Dusts. Face piece is of standard (patented) construction with large off-set filter plates attached. Screw cap lid has been eliminated entirely and the filtered air passes easily between the plate extrusions to the protected opening and into the respirator interior. Marginal edge of plate has ingenious, inwardly curved edge to securely anchor filter pads and prevent leakage. This new construction principle not only assures a larger filter area for easier breathing but greater comfort to the wearer because of unobstructed vision and extremely light weight.

New Style Laboratory Mixer QC 407

A new style laboratory mixer is available, powered by a 1/30 H. P. totally enclosed, air-jacketed and fan cooled motor. This mixer duplicates on a laboratory scale actual work of large scale production. It is ruggedly built and designed for continuous duty operation at full load. Wing nuts permit numerous adjustments to produce a wide variety of mixing actions. It is manufactured in several anti-corrosion metals. Housing is tapered for insertion in small neck bottles or jugs. This mixer can be equipped with folding propellers which open by centrifugal force after insertion into small openings. Can also be fitted with bung-hole adapter. Weight complete is slightly under 7 lbs. Besides its laboratory uses, this model is finding many applications on a commercial scale for mixing small batches of fluids.



Other New Equipment Briefly Mentioned

A new stationary heavy duty air and gas compressor (QC408); Foot guards of novel design that should be used in plants where drums, etc., are lifted manually (QC409); a new strain detector made possible by the development of Polaroid (QC410).

Chemical Industries,
P.O. Box 1405,
New Haven, Conn.

I would like to receive more detailed information on the following equipment: (Kindly check those desired.)

QC 403	QC 407
" 404	" 408
" 405	" 409
" 406	" 410

Name..........

Title.......... **Company**..........

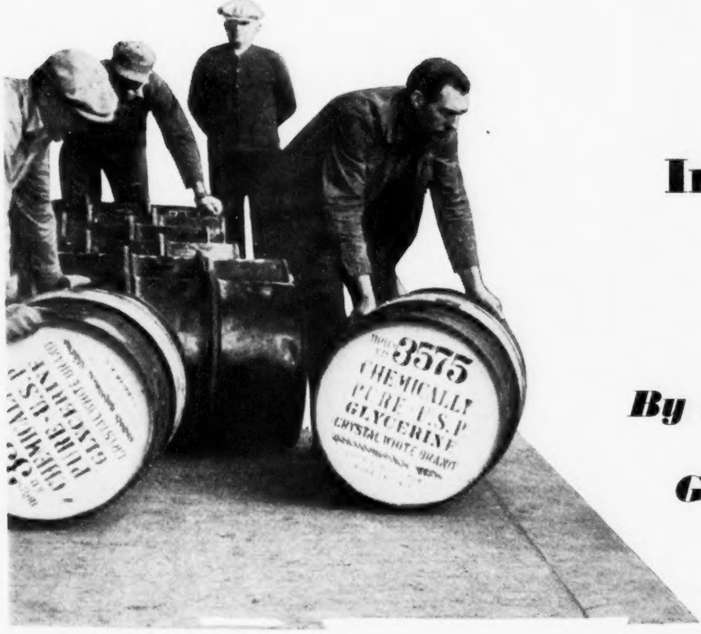
Address..........

CHEMICAL SPECIALTIES

HOUSEHOLD
INDUSTRIAL
AGRICULTURAL

- Glycerine in Industrial Specialties
- Chromium Anti-Corrosion Preparations
- Sulfur Acid-proof Cements
- Chemicals in Wood Treatment
- Leather Adhesives
- Trade Marks and Patents
- Cash Ideas
- Association News

Pontalite, a new crystal-clear thermoplastic announced by du Pont.



Glycerin in Industrial Specialties

Part I

By Milton A. Lesser, B.Sc. and Georgia Leffingwell, Ph.D.

WHEN, at the close of the war, glycerin was returned to its normal position among the essential chemicals, from which it had been almost wholly diverted for explosives, despondent individuals "viewed with alarm" the accumulations. Yet almost from the cessation of warfare, no marked surplus has existed. Manufacturers who had been forced to use substitutes, returned to glycerin. (1) To quote a recent technical report, "the consuming industries are increasing their demands for supplies." (2) The continuous absorption of glycerin is due to one basic reason, the continuous diversification of its consumption. (3) A large factor in this is the specialties field.

Nearly all branches of manufacture use glycerin, either as a constituent of the product itself or as an ingredient of some specialty used to make the process easier or the product better.

The physical properties indicate its adaptability and versatility. The outstanding characteristic is its hygroscopicity which enables it to absorb moisture from the air, and under certain conditions to absorb up to 50 per cent. of its own weight of water. This makes it invaluable in preparations where the moisture content must be maintained, or where excessive drying is detrimental. Coupled with this characteristic is its syrupy nature, which in varied dilutions is used as the standardizing fluid in certain types of viscosimeters. Whenever it is desirable to thicken a preparation, glycerin serves the purpose. Clarity, and the water whiteness of the pure product should be considered important factors. Because of its neutrality, glycerin may safely be used where pH is important. Glycerin is not corrosive, and so does not affect metals. It is very stable, having a high boiling point (290° C), which does not permit evaporation, and a low melting point (17° C). (4) Its freezing point is at a very much lower temperature. When diluted with alcohol or water, glycerin has the added advantage of depressing the freezing point of both of them. Its excellent solvent powers are well known. The fact that glycerin is insoluble in ether, chloroform, and gasoline gives it certain advantages. It does not turn rancid and has a definite preservative action in the preparations of which it is a constituent. Although glycerin enters into many chemical combinations, they shall not be discussed, but will be indicated in the text.

A factor which must not be overlooked is the availability of glycerin. Unlike many other compounds, it can be obtained anytime, anywhere. The source of supply is as constant and dependable as the supply of soap.

With these properties in mind, it is then a simple matter to indicate glycerin's position in the manufacture of specialties. Examination of patent records, industrial literature and standard formularies, such as those of Bennett, Henley or Hopkins, yields large numbers of glycerin containing preparations of all types.

Glycerin enters into the tanning and finishing of leather, displaying its action as a hygroscopic agent to make and keep the leather soft and pliable. Glycerin is used in coloring and graining preparations. In the finishing of fine leathers it is particularly important as an ingredient of the better type of leather dressings, specially for the light tans and browns. Illustrative are the following leather dressings, used for greasing fine patent and kid leathers.

White Cream

Lard	75%
Glycerin (Tech.)	25

Some odorizing material may be added if desired, but Oil of Mirbane, often recommended, should not be used since its vapors are toxic. (5)

Black Cream

Lard	100
Vaseline (Yellow)	20
Glycerin (Tech.)	10
Castor Oil (Tech.)	10

Mix. Dye with lampblack. Perfume if desirable.

Examples are given of a dressing, a polish, and a cleaner that are indicative of these types of preparations made with glycerin.

Russet Leather Dressing

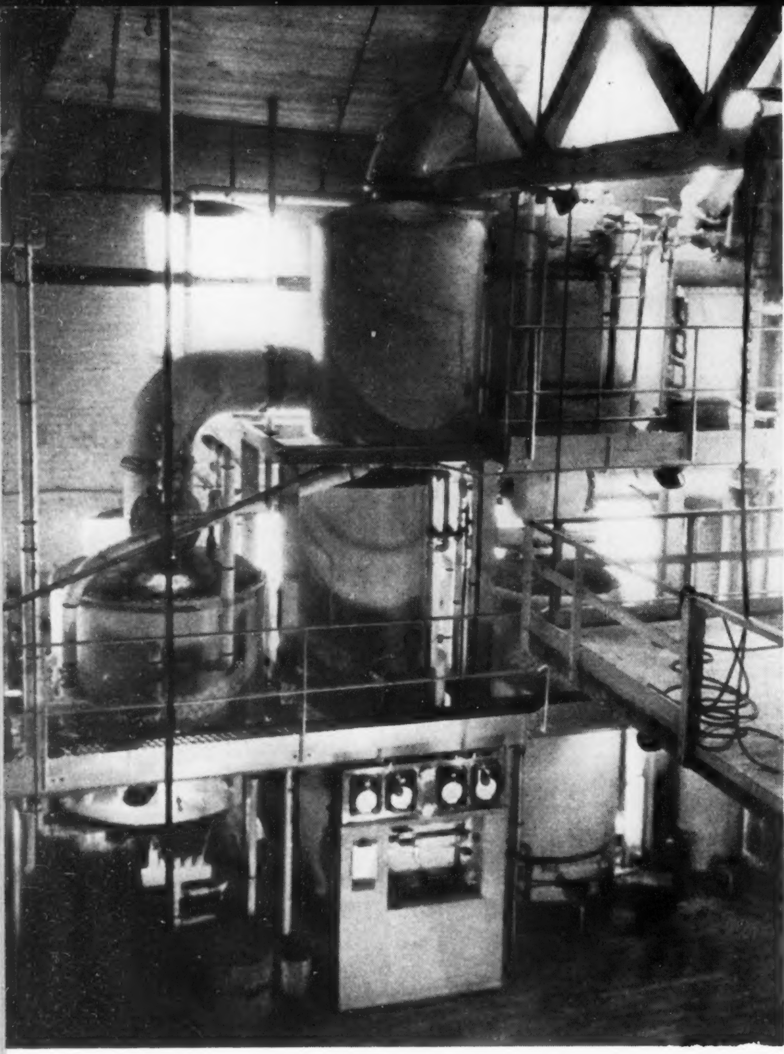
Palm Oil	16
Common Soap	48
Oleic Acid	32
Glycerin	10
Tannic Acid	1

Melt the soap and palm oil together with gentle heat, add the oleic acid. Dissolve the tannic acid in the glycerin and add to the mixture. Stir well till cold.

Russet Shoe Polish

Borax (Crystal)	40
Glycerin	20
Ammonia	2
Bleached Shellac	200
Aniline Yellow, No. 690, Water Soluble	6
Formalin	1
Water	1200

Dissolve the borax in 1000 parts of water, add the shellac and boil till dissolved. Dissolve the dye in 200 parts of boiling water, add glycerin, and stir into hot mixture, continue stirring and when fairly cool add the ammonia and formalin.



Glycerin refining equipment in one of the large glycerin refining plants.

Leather Cleaner and Stain Remover

Powdered Castile Soap	6
Water	160

Boil together till soap is dissolved and add:

Ammonia	6
Glycerin	14
Ethylene Dichloride	7

Numerous similar glycerin contained formulae for leather dyes, softeners, finishes, and general tanning preparations are available. Glycerin is a constituent of many artificial leathers. Though not strictly a leather formula, the following white canvas shoe cleaner might well be noted, for use on white shoes:

Zinc Oxide	12
Pipe Clay	24
Bleached Shellac	6
Borax	18
Sugar	12
Glycerin	6
Water	30

Dissolve the borax in the hot water, add the shellac and stir till dissolved, stir in the sugar and glycerin and finally add the zinc oxide and pipe clay, mixing well.

The textile industry uses glycerin in many stages of processing, for the soft pliant feel of the finished product it produces. Textile sizes employ glycerin as the following formula illustrates.

Corn-starch	85
Sulfuric Acid (66° Bé.)	0.4
Glycerol	10
Water	1000

Enough caustic soda is added to make the solution neutral.

Glycerin is of major importance in the dyeing and printing of textiles; (6) in pigment and vat colors for rayons and cotton, and in the acid colors for silk and wool. "Wool Protectors", made with glycerin, are used in the vat dyeing procedure. Wool material printed by this method suffers no loss of strength and does not acquire a harsh handle. An illustration of the employment of glycerin in the finishing of heavy woolen cloth is the following:

Water	15 gals.
Potato Starch	3¾ lbs.
Lopogum	6 ozs.
Glauber's Salt	3⅛ lbs.
Magnesium Sulfate	2½ lbs.
Glycerin	10 ozs.

Glycerin is used extensively to degum flax, and to impart the soft gloss of the finished cloth.

Glycerin is an excellent detergent material. The importance of detergents has never been more apparent than in the last few, world wide, drought years. Unplenished water supplies have caused abnormal salt concentrations, which in the washing and dyeing baths, cause curding of the soap and consequent streaking and spotting, resulting in enormous losses to the industry. Many preparations, usually patented, have become available. Glycerin plays its part here. A recent patent describes such a preparation as, "a cleaning, washing, emulsifying, dispersing, softening, etc., agent, which is made by treating spermaceti with sulfuric acid in the presence of anhydrous glycerol. The product is a white powder, resistant to lime and acid." (7)

In the specialized treatment of fabrics, glycerin preparations make them gas, water and fire proof. Glycerol-phthalic anhydride resins are employed to coat threads or finished cloth to render them impervious to water, or for other desirable properties. A patented English soap to make cotton uninflammable after washing is described by Martin (8) and is made as follows:

Dry Powdered Soap	180
Sodium Silicate	24

Mix together. To this add 8 parts of oleic acid previously saponified or made into a dry paste with potassium carbonate. Now add:

Glycerin	7
Sodium Tungstate	4

Many of the preparations used in the finishing and polishing of their products contain glycerin. It is an ingredient of many metal polishes, particularly the specialized types. The following is a case in point.

Aluminum Polish

Whiting	75
Fine Yellow Tripoli	20
Sodium Bicarbonate	3
Potassium Sulfocyanide	2

A 25% aqueous solution of glycerin is added to the mixed dry ingredients until a paste of the desired consistency is reached (Note—the cyanide salt makes this a poisonous preparation).

The gold polish formula following is patented, but the listed constituents will indicate the ingredients of such a preparation.

Soap	20–25
Coconut Oil	1
Precipitated Chalk	25
Kieselguhr	8
Glycerol	40–50
Lemenone (to Odorize)	1

A detailed description for a silver polishing soap, too long to be included here but well worth consideration, is given by Martin (9). A varnish, for coating polished copperware should prove useful in preventing tarnish.

Sandarac	10
Rosin	3

Dissolve in alcohol to consistency desired and add glycerin—½.

Although the tendency appears away from iron stoves, enough of them are used to warrant inclusion of an old-fashioned stove polish.

Mix graphite with sodium silicate to the consistency of a smooth paste, add one ounce of glycerin for each pound of paste. A small amount of aniline black may also be added. This polish is applied with a stiff brush.

Soldering fluids employ glycerin as this formula shows:

Zinc chloride	10
Glycerin	5
Alcohol	5
Water	25

Brass and copper soldering pastes are also made with glycerin as an ingredient.

In the manufacture of rubber articles glycerin is an excellent mold liner or lubricant to prevent sticking. Embossing of rubber materials is easier and sticking to the rolls is prevented, if the following solution is applied to the rubber first.

Glycerin	5
Denatured Alcohol	95

Rubber can be softened and kept soft if glycerin is applied judiciously before storage. To renew rubber articles such as gloves, typewriter platens, etc., which have become brittle by exposure to extremes of temperature, the solution here described is rubbed on with a cloth, and the article allowed to stand for a day in a warm place.

Glycerin	1
Ammonia	1

After this time the excess fluid is wiped off and the article is again ready for use. Glycerin is also used in rubber oil proofing.

Adhesives of every description utilize the moisture retaining and preservative action of glycerin. It is an ingredient of library pastes and in the labelling machine adhesive. Such formulae are easily obtainable. The growing use of Cellophane, into the manufacture of which glycerin enters, has brought with it many adhesive problems. The following Cellophane adhesive has been suggested for general use.

Acacia	18
Glycerin	30
Water	52

Soak the Acacia overnight in the water. Strain and add the glycerin.

Glycerin is usually used as the plasticizer for glues and so enters into the composition of many of the specialized applications of this material. The amount of glycerin used in glues varies with the season and location, smaller quantities are needed in the summer and in the tropics, when and where the humidity is fairly high.

Glycerin-litharge cements serve a wide variety of purposes. Variations in the percentages of the ingredients can adapt these cements to resist the action of heat, pressure, oils, acids, and in sulfite digesters of paper mills. An electrical conducting cement, with many potential applications is made of

Lamp black	1
Litharge	2
Glycerin	3–8

The quantity of the glycerin used varies with the hardness and setting time desired.

The following is a solution for making semi-dry electrolytic condensers.

Glycerin	3
Sodium Borate	1

The compounds are mixed, heated to a boil, after which the condensers are impregnated.

In the last few years wood doughs or plastic putties have become popular. Bennett supplies a generalized formula:

Gum Solution	1 gal.
Glycerin	1 gal.
Butyl Alcohol	3 pints
Whiting	8 lbs.
Wood Flour	24 lbs.
"Dope" Solution	8 gals.

The gum solution consists of gum rosin (W. W. Rosin), cold cut (dissolved) in one gallon of methyl acetone. The "dope" is another cold cut solution, consisting of one pound of "movie" scrap to each gallon of methyl alcohol. The film should be desilvered by soaking it in hot water to remove the gelatine coating, then laid out in the sun and air to dry. It can be obtained from dealers clean and ready for cutting. Where larger quantities are to be produced it might be well to use a suitable nitrocellulose solution of the proper viscosity to replace the "dope." When using this dough to fill depressions, it should be smoothed down well, before hardening, which it does rapidly. Of course this material must be kept in air tight containers.

Bibliography:

1. Parke, W. F., and Lewis, E., Chemistry and Industry (London), 47, 42, 1073-1092, Oct. 19, 1928.
2. Chem. & Met. Eng., 42: 55, Jan. '35.
3. Oil & Soap, 11: 69-71, 1934.
4. Hodgman, C. D., and Lange, N. A., "Hand Book of Chemistry and Physics" (Chem. Rub. Pub. Co.), 15th Ed.
5. Bureau of Standards, L C 275, "Polishes."
6. Leffingwell, G., Am. Silk and Rayon Jour., August 1936.
7. Swiss Patent, No. 171, 359, Nov. 1, 1934.
8. Martin, G., "Modern Soap and Detergent Industry" (London 1931), Vol. II, Sec. III, p. 14.
9. Ibid.: Vol. II, Sec. IV, p. 48.

To be concluded next month.

Bichromates as Inhibitors in Brine Systems

Bichromates as corrosion inhibitors in calcium chloride brines in refrigeration were thoroughly tested by the Grimsby Ice Co., Great Britain, and results reported to the British Association of Refrigeration. Paper was one in a symposium on "Corrosion in the Refrigerating Industry."

The Grimsby trials were undertaken to check these results. Sodium bichromate crystals were added to the brine at the rate of 1.6 grams per liter, and the brine maintained just on the alkaline side of neutrality. Tests were carried out in two tanks, each of nearly 4,000 cu. ft. capacity. Tanks were of steel, and the ice cans of lead-covered steel. Ice-making temperature was approximately 17° F., using calcium chloride brine having a specific gravity of approximately 1.16. One of the tanks was treated with sodium bichromate, and the other untreated for purposes of comparison. Trial ran continuously for 405 days, from Jan. 23, '35, to March 4, '36. Following conclusions were reached:

Protection against corrosion, due to the addition of the sodium bichromate as above, is estimated at 80-90%. Treatment has no detrimental effect on the lead-coated ice can. Treatment is simple, and the correct running conditions of alkalinity, etc., can be maintained without difficulty by plant engineers. At the Grimsby works themselves, corrosion by untreated brine has not been particularly serious, but the bichromate treatment is suggested by the authors as of distinct value in plants where troubles are being experienced.

Improved Sulfur Acid-Proof Cements

Announcement has been made of an improved sulfur base acid-proof cement valuable for the protection of industrial and municipal sewers against disintegration by acid industrial wastes and acids formed by the decomposition of organic matter in sewage. This sulfur base cement has solved many problems in industry, including construction of tanks for the pickling of steel, acid storage tanks, neutralizing pits, leaching tanks, electrolytic cells and acid-proof floors and trenches. Report gives the physical and chemical properties of the cement and describes various types of construction in which it is used. Utility of the cement for the protection of existing concrete sewers against corrosion and the methods of construction of new sewers are discussed. Dr. C. R. Payne, "Sulfur Base Cements Protect Sewage Works," *Municipal Sanitation*, November, '36.

Leather Adhesives

By Charles F. Mason, Ph.D.

FABRICATION of leather into its multifarious forms for daily use shares in the forward technological surge, and the use of modern synthetic materials in adhesives, fillers and water-proofing agents increases rapidly. Until quite recently adhesives were used only for making a water-proof bond and for convenience in holding the parts in place for the subsequent sewing operation. To-day half soles are applied to shoes by adhesives and subsequent pressing in a machine for about thirty minutes; insoles are replaced and bonded in fifteen minutes while the customer waits, and leather goods of many forms with no visible stitches and remarkably high mechanical strength appear on the market.

The large producers of leather-working machines make and sell these adhesive preparations except those which contain cotton bases like Celluloid, nitro and acetate cotton, which are largely left for lacquer producers. Others depend upon industrial chemical specialty manufacturers who are producing rubber cements, spirit varnishes and general adhesives. But a comparatively new class of specialty producers has recently become prominent in the leather trade. In this trade today one can find rubber latex selling for $3.00 per gallon in quart containers upon which four hundred per cent. profit is realized, other instances are lacquers and rubber cements at $5.00 per gallon and not very well suited to the particular purpose.

The equipment necessary for production upon a plant scale of the following modern leather adhesives are steam heated kettles, wooden and steel mixing tanks equipped with motor driven propellers, and where rubber is used, churns or rotary grinders to break down the swollen rubber into a colloidal solution smooth enough for spreading.

Leather to Leather Adhesives

Water	76 parts by weight
Borax	4 " " "
Casein	20 " " "

Soak the casein in the steam kettle with water for one half hour, then start heating and add the borax which has been dissolved in some water. Heat and stir until it is uniform in consistency. Venice turpentine or rosin oil varnishes to the amount of 10 parts can be stirred in after it has cooled to improve the adhesion. This bond will not be water-proof.

Rosin	30 parts by weight
Rubber, crude	20 " " "
Linseed varnish	20 " " "
Benzine	30 " " "

The rosin and rubber are melted over direct heat with constant stirring; the varnish is added when a complete mixture is obtained; after cooling the benzine is added and the mixture allowed to stand 24 hours. This will require churning.

Celluloid	20 parts by weight
Acetone	79 " " "
Oxalic acid	1 " " "

Ingredients are mixed and heated in an autoclave with constant stirring for sixteen hours; the object being to obtain a solution of low viscosity and easier spreading property.

Celluloid	20 parts by weight
Acetone	80 " " "

This viscous solution is obtained by mixing. It is applied to the parts, allowed to dry and after moistening the film with more acetone the pieces are pressed together and held ten minutes. Other solvents than acetone are methyl ethyl ketone, hexalin acetate, ethyl acetate, and amyl acetate.

Rosin	67 parts by weight
Ammonium Hydrate (Sp. Gr. 0.91)	11 " " "
Benzine	22 " " "

Finely powdered rosin is immersed in the ammonium hydroxide or, to use a commercial term, hydrate, and stirred until uniform. The benzine is stirred in and a thick paste results. This bond will be simply one of rosin and ammonium salts and will be brittle.

Rubber, crude	20 parts by weight
Rosin	40 " " "
Linseed oil	40 " " "

The rosin and rubber are carefully melted in the same container over direct heat and when uniform the oil is added slowly and stirred in. This will set upon cooling to a stiff mass and warming is necessary before use.

Gutta Percha	10 parts by weight
Benzol	65 " " "
Linseed varnish	25 " " "

Can be made cold and will be slow in drying and thermoplastic in that gutta percha softens with the application of heat and hardens again upon cooling with small changes in bonding strength if charring has not set in. It should not be used upon bonds exposed to temperatures as high as boiling water.

Rubber, crude	12 parts by weight
Carbon disulfide	80 " " "
Venice turpentine	8 " " "

This is made by simple mixing after the rubber has been shredded or masticated to hasten solution (an operation necessary in all operations where rubber is brought into solution cold with a volatile solvent). Churning is necessary and the usual precautions for avoiding the inhalation of fumes (poisonous) and fire prevention are to be taken.

Animal glue	25 parts by weight
Water	75 " " "

The powdered glue is allowed to soak twenty-four hours and then brought into solution by heating in a steam kettle. It is applied to the parts and over the film is spread a 10% solution of potassium bichromate which when exposed to a direct source of light hardens and is water-proof.

Leather Straps and Belts

Celluloid	8 parts by weight
Acetone	24 " " "
Venice turpentine	1 " " "
Benzol	67 " " "

The Celluloid is brought into solution first and then the other two components are added.

Carbon disulfide	59 parts by weight
Turpentine	6 " " "
Gutta percha	35 " " "

This is made by simple mixing and in case the gutta percha, as a result of varying properties, fails to bring the consistency of the solution to that of a paste, more can be added. It requires twenty-four hours to dry and set and is thermoplastic.

Sandarac gum	6 parts by weight
Venice turpentine	6 " " "
Alcohol (95%)	88 " " "

Made by simple solution of gum in alcohol and the addition of turpentine later. This can be added and stirred into the next formula to increase the adhesion.

Glue (from leather waste)	20 parts by weight
Glue, fish	20 " " "
Water	30 " " "
Tannin solution 30%	30 " " "

The glue is immersed in the water and allowed to soak for twelve hours after which the tanning solution is added and heated until uniform.

Asphalt (Gilsonite)	5 parts by weight
Rosin	4 " " "
Gutta percha	16 " " "
Varnoline (petroleum dist.)	24 " " "
Carbon disulfide	51 " " "

The Gilsonite, which will not dissolve in these solvents until melted, is melted and stirred with the rosin and gutta percha; it is allowed to cool and after pulverizing is immersed in the solvents and stirred until solution results.

Leather Fillers

Rosin	30 parts by weight
Paraffin	65 " " "
Mineral color (desired)	5 " " "

The rosin and paraffin are melted together and the color is stirred in while the mixture is congealing during the cooling operation. It is to be applied after resoftening with heat.

Gutta percha	20 parts by weight
Leather meal (ground leather)	80 " " "

Method of Manufacture

The gutta percha is melted over direct heat and while cooling the leather meal is stirred in. Care must be taken to avoid excess heat during production or subsequent reheating for fear of charring the leather. This is thermoplastic and the usual precautions in use are necessary.

Leather to Vulcanized Rubber

Gutta percha	10 parts by weight
Carbon disulfide	40 " " "
Shellac	14 " " "
Venice turpentine	1 " " "
Alcohol	35 " " "

The gutta percha is dissolved in the carbon disulfide in one container and the shellac, alcohol and Venice turpentine in another. When solution is complete the two are mixed. During application the carbon disulfide will exert a softening action upon the rubber and the deposited film or bond of gutta percha, shellac and Venice turpentine has one component similar to rubber; the gutta percha, which will bond tenaciously.

Gutta percha	16 parts by weight
Carbon disulfide	79 " " "
Rosin	2 " " "
Asphalt	3 " " "

This is made by simple mixing and the asphalt must be chosen carefully; if Gilsonite or any of the other natural asphalts, it should be heated in a separate container at or above the melting point for one half hour to render it soluble when immersed, cold, in the solvent.

Rubber (raw)	2 parts by weight
Mastic (gum)	18 " " "
Trichlorethylene	80 " " "

Leather to Glass

Rubber, crude	9 parts by weight
Japan wax	13 " " "
Rosin	31 " " "
Benzine	47 " " "

The rubber, wax and rosin are melted and added to the warm benzine. Upon cooling the wax and rubber will form a semi-crystalline gelatinous mass which will require churning to bring about the correct consistency for application.

Leather to Synthetic Resin Plastics

1. Cellulose acetate	5 parts by weight
Alcohol	90 " " "
Triphenylphosphate	5 " " "
2. Bakelite	30 " " "
Alcohol	70 " " "

In other special cases like leather and wood, leather and Celluloid, leather and metal, leather and textiles, they can be chosen from the above lists with due consideration for color and other properties. In the case of wood one containing a varnish base will be suitable, with Celluloid one containing a solvent for Celluloid, like acetone, will suffice, and in the case of metal one containing a non-drying element or component is necessary. An example is Venice turpentine.

In some of these formulas one will find chemicals which are not only expensive but toxic and peculiarly explosive under factory conditions where large quantities are used and workers become careless. These are carbon disulfide, trichlorethylene, and benzol. The trade which has formed the bad habit of thinking they can detect the materials present and the merits of the product by smelling of it seem to demand these characteristic odors of solvents which were perhaps the only ones available when the first products were formulated.

However they can be substituted by less expensive solvents in part after careful consideration or trial by solubility. Where less expensive resins are desired substitutions can be made, as in the case of gutta percha for which extracted resins still containing some of the gutta percha hydrocarbon are available upon the market. There are now three different forms of rubber upon the market for which there is no use in vulcanizing industries and their outlet is in the field of adhesives.

Chromium Anti-Corrosion Preparations

Chromium-containing anti-corrosion preparations, suitable for use as coatings or impregnating compositions, as temporary protectives, and as lubricants for machinery, are made by treating with a neutralizing agent, a chromic acid-containing solution of a substantially water insoluble chromate, and is characterized in that at least one of the reacting ingredients is a solution which forms one phase of an emulsion. For instance, an emulsion containing caustic potash in its aqueous phase may be mixed with another emulsion, the aqueous phase of which comprises a solution of zinc chromate in chromic acid. The non-aqueous phase of either or both of the emulsions may comprise a drying oil, *e. g.*, may be a paint, and lecithin is a specified ingredient that may be present. English Patent 450,328 ('35).

Chemicals in Wood Treatment

Chemicals used in wood treatment are reported upon by the Forests Products Research Board of the Dept. of Scientific and Industrial Research (British). Among the subjects covered in the report, obtainable from H.M.S.O., London, England, 2s net, are the possibility of establishing a standard test for determining the toxicity of wood preservatives, improvements in creosoting processes, preservation of mine timber, protection against the powder post beetle, insecticides in wood glues, and mould-resistant paints.

American Soaps in Canada

Canada, one of the largest foreign purchasers of American soaps, washing compounds and similar products is rapidly becoming self-sufficient, its domestic production having increased 18% in '35. Total value of '35 output of soaps, washing compounds and cleaning preparations aggregated $16,000,000 compared with $13,614,500 during the preceding year. Canada bought $349,762 worth of American soaps last year compared with $312,000 in '34. More than 70% of the total consisted of laundry soap.

Household Specialties

Fumigators Discuss Change of Title

Officers and members of the National Association of Exterminators and Fumigators are giving considerable thought to a possible change in the title of the organization to the National Pest Control Association. The idea was proposed at the recent Cleveland convention and received considerable support. It is felt that such a title would be much more representative of the actual services performed by the members than the present title. Many in the industry realize more than ever that there is a great deal more to the work than merely eliminating a pest infestation, such things as involved structural changes, repair work, treatments to prevent rather than eliminate infestations, etc. Leaders of the industry also realize however, that there are the obstacles in terms of a "time factor" that must be taken into consideration. To affect any such change, the majority of the industry regardless of Association affiliation must see the picture in the true light so that upon the announcement of any such change there will be that unwritten approval and adherence to carry out the policy.

Bartlett W. Eldredge, new president of the Fumigators & Exterminators.

In reality there is a threefold program involved in that the possibilities of changing a general title for the industry involves adherence to ethics as well as advertising of every description whether such advertising be done by way of classified telephone directories, letters, or any form of leaflets, etc. Officers of the Association will welcome comments on the proposed change from both members and firms not holding membership at the present time.

At the recent convention, the Association adopted a partial Code of Ethics which will become a part of the Constitution and By-Laws. It is contemplated to add a few more clauses, the principal one of which will be on the subject of "Advertising".

Glyco's Polish Authority Available

Having recently engaged the services of Germany's leading polish chemist, Glyco Products, 148 Lafayette st., N. Y. City, is prepared to help manufacturers of shoe, furniture, auto and metal polishes, who desire to improve, change or add to their line. Interested companies are invited to write to Glyco Products, stating their problem as completely as possible. This service is free.

To Keep Sweeping Compounds Damp

Calcium chloride serves to keep sweeping compounds damp. Proportions most satisfactory are: calcium chloride 10%, water 20%, abrasive 70%. First two are mixed and then added to the third ingredient.

Specialty Company News

P. & G. has granted a bonus and wage rises of about 7½%. Amount will reach approximately a million dollars. Wage rise became effective Dec. 1st.

J. L. Prescott Company, Passaic, is offering 53 cash prizes—first of $200—in a newspaper-promoted contest for a slogan for "Oxol" cleanser.

Drackett Co., Cincinnati (Ralph H. Jones Co. advertising agency), announces its "largest campaign" for Drano, to run next year in magazines and radio.

Kirkman & Son, Inc., 215 Water street, Brooklyn, N. Y., (soaps) place its advertising with N. W. Ayer & Son, Inc., effective immediately.

Berlou Manufacturing Co., producers of moth-proofing chemicals, formerly located at Minneapolis, Minn., is now located at Marion, Ohio.

The W. H. and L. D. Betz Co., Philadelphia, is taking over a plant at Rockland, Me., and will produce water treatment products from seaweed.

Northwestern Chemical's plant at East Norwood, near Marietta, Ohio, was sold recently under foreclosure for $33,334.

Japanese Pyrethrum Crop Report

Japan's '36 pyrethrum flower harvest is estimated at approximately 27,752,800 lbs. compared with 24,400,000 lbs. in '35, according to reports from Kobe. Advance estimates made in July indicated an output of about 25½ to 30 million lbs. but this was revised downward as it became evident that the cold spring had injured the Hokkaido crop. Good weather during the drying season in Hokkaido is said to have resulted in an improvement in quality over last year's crop.

While a very large percentage of American pyrethrum imports originate in Japan, receipts from Kenya are increasing rapidly. Imports from that colony during the first 9 months aggregated 1,167,230 lbs. against 66,575 lbs. during the corresponding months of last year.

Federal Trade Commission Notes

Commission charges Indianapolis Soap with unfair competition through excessive price marking of soap. Randolph A. Menefee, trading as Khylex Chemical, Chevy Chase, Md., agrees to stop advertising that "Khylex" will remove ink spots when followed by an application of vinegar and several other alleged misrepresentations of the product. Charles F. Slade & Co., 102 Clinton st., Buffalo, agrees to stop claim that "S-K-O Slade's Solution", will sterilize bathroom equipment or other articles.

N. Y. City Fumigators' Strike Ends

Strike of the fumigators and exterminators in N. Y. City which continued for 11 weeks was finally settled last month.

Colgate-Palmolive-Peet Receives Dividend

Colgate-Palmolive-Peet has been informed that the government of Poland, which restricts transmission of funds to foreign countries, has granted the Colgate-Palmolive Spolka Z. O. O. of Warsaw permission to remit a dividend of 6% for the year to its American stockholders.

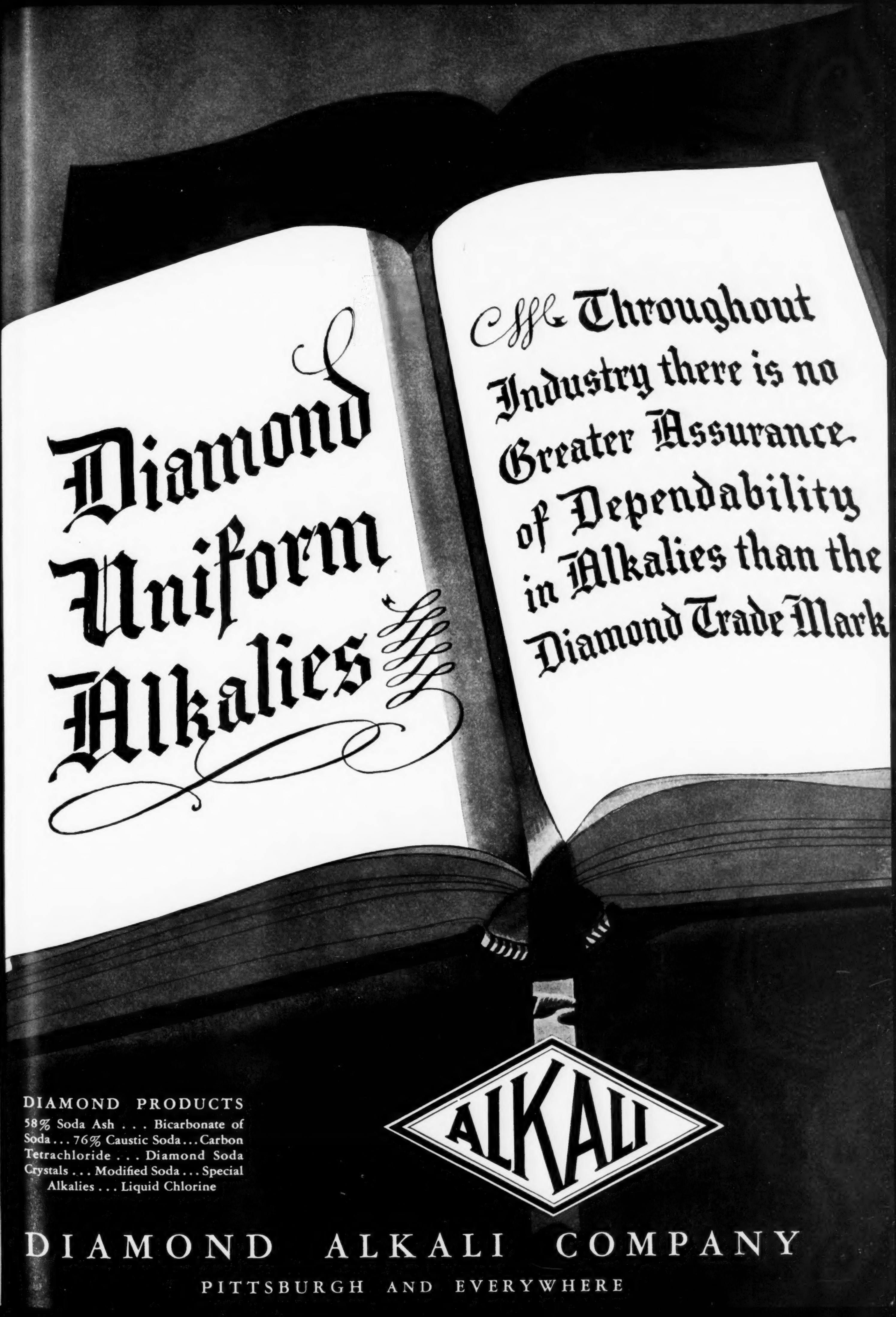
S. Bayard Colgate, president, Colgate-Palmolive-Peet, stated the dividend is only part of the amount earned by the Colgate-Palmolive Spolka stock, but expressed the belief that the government may be favorable in the future to granting additional releases.

Data on Fumigation with Hydrocyanic Acid

Data on the efficiency of fumigation with hydrocyanic acid gas as affected by the methods of producing and applying the gas, the type of construction of the building, the preparation of the mill, wind velocity, etc., observed in many mill fumigations in the middle western U. S. and extending over a period of 2 seasons are reported upon. Observations were made as to the relative cost and as to the efficiency of the fumigations in terms of insects killed and in gas concentrations obtained. Details are given in 3 tables and several graphs. R. T. Cotton, H. D. Young, G. B. Wagner, *Jour. Econ. Ent.*, 29 (1936), No. 3, p514.

U. S. Imports of Derris and Cube Roots

U. S. imports of crude derris and cube roots, a relatively new class of insecticide materials, amounted to 830,665 and 657,500 lbs., respectively, during the first 3 quarters of the current year and during the same period a total of 861,000 lbs. of partially processed derris and cube were received. The derris came chiefly from British Malaya and the Philippines while the cube originated largely in Brazil and Peru.


Diamond Uniform Alkalies
Throughout Industry there is no Greater Assurance of Dependability in Alkalies than the Diamond Trade Mark
ALKALI
DIAMOND PRODUCTS
58% Soda Ash . . . Bicarbonate of Soda . . . 76% Caustic Soda . . . Carbon Tetrachloride . . . Diamond Soda Crystals . . . Modified Soda . . . Special Alkalies . . . Liquid Chlorine
DIAMOND ALKALI COMPANY
PITTSBURGH AND EVERYWHERE

Industrial Specialties

Specialty Co's to Exhibit at Cleaners' Exposition

A large number of chemical specialty houses have reserved space for the coming convention of the National Association of Dyers and Cleaners to be held at the Netherland-Plaza in Cincinnati, Jan. 25th to the 28th. Among those taking space are:—Takamine Laboratories, Clifton, N. J.; Riverside Manufacturing Co., St. Louis; Johns-Manville, N. Y. City; Midland Chemical Laboratories, Dubuque, Iowa; Caled Products Co., Cottage City, Brentwood, Md.; The M. Werk Co., Cincinnati; Armour, Chicago; Huntington Laboratories, Huntington, Ind.; R. R. Street & Co., Chicago, Ill.; Carman & Co., N. Y. City; The Prosperity Co., Syracuse, N. Y.

Also Eaton-Clark, Detroit; J. B. Ford Sales, Wyandotte, Mich.; Davies-Young Soap, Dayton, Ohio; Dicalite Co., N. Y. City; Darco Corp., N. Y. City; Anderson-Prichard Oil Corp., Oklahoma City, Okla.; American Disinfecting Co., Sedalia, Mo.; Merchants Chemical, N. Y. City; P. & G., Cincinnati; and Sterling Products, Easton, Pa.

New Line of Tripoli Compositions

Hanson-Van Winkle-Munning, Matawan, N. J., has developed and now offers to the trade a new line of hard, firm tripoli compositions which, it is claimed, give maximum results in high speed production, finish and low costs. These new compositions, Grades 2-D-20, 2-M-125 and 2-M-128 are designed for general buffing on brass, aluminum, copper and die castings. They are particularly recommended for high speed hand buffing and for automatic machine work.

Method of Producing Wetting Agents

Wetting agents are produced by acylating primary or secondary alkoxyarylamine-*m*- or *p*-monosulfonic acids of the benzene series with oleic acid or its anhydride or chloride. Following example is given: 4-Amino-1-ethoxybenzene-2-sulfonic acid is stirred in caustic soda solution with gradual addition of oleic acid chloride, the temperature being kept below 15° C. and the jelly-like paste obtained is neutralized; product may be used as a scouring and dispersing agent, its aqueous solution being stable to hydrolysis by mineral acids and exerting a powerful dispersing action on lime soaps. British Patent 452,139 ('34) assigned to I.C.I.

Phosphates in Textile Washing

In textile washing where hard water is used with washing-agents stable to hard water, precipitates or deposits of inorganic metal salts are avoided or removed by adding to the washing solution, or treating subsequently with a solution of, a mixture of a water-soluble salt of a phosphoric acid and a water-soluble salt of a polymeric carboxylic acid. Examples of solutions are (1) trisodium phosphate and sodium polyacrylate with the sodium salt of oleic acid methyl tauride; (2) disodium phosphate and sodium polyacrylate with the sodium salt of palm nut oil tauride; (3) trisodium phosphate and sodium polyacrylate with the sodium salt of oleic acid sarcoside. Process controlled by the I. G. Details disclosed in English Patent 451,342.

Specifications Available on Asphaltic Road Mat'ls

A tabular summary of State specifications for liquid asphaltic road materials in effect Jan. 1, '36 has been published by the U. S. Bureau of Mines, Dept. of the Interior, in response to requests for such information.

Measurement of Flow of Printing Pastes

A method of measuring the flowing properties of printing pastes as well as the pastes used in preparing them were described by Dr. Sivert N. Glarum at the recent meeting of the American Association of Textile Colorists and Chemists at Providence. These measurements permit the accurate comparison of pastes for such qualities as "body," "false body," "length," "shortness," etc., which have previously been very indefinite terms. These measured properties show a very direct relation to printing qualities. The characteristic flowing properties of a wide variety of thickening materials were shown.

Vegetable Oils Sulfonated in 3rd Quarter

Vegetable oils sulfonated in the 3rd quarter totaled 6,001,308 lbs. according to the Census Bureau, divided as follows:—Coconut oil, 274,927 lbs.; corn, 93,399 lbs.; olive, 1,675,537 lbs.; castor, 3,349,275 lbs.; rapeseed, 187,286 lbs.; teaseed, 309,095 lbs.; miscellaneous, 122,789 lbs. Animal oils sulfonated totaled 5,057,745 lbs., divided as follows:—Tallow, 1,849,250 lbs.; cod, 2,060,388 lbs.; neatsfoot, 375,226 lbs.; sperm, 404,578 lbs.; red oil, 320,367 lbs., and miscellaneous, 47,936 lbs.

Evaluation of Tannins for Dyes and Inks

Standard hide-powder process of evaluating tanning materials for the leather industry is not suitable for the dyeing and ink industries, because certain tannin derivatives included among the "nontans" have greater tinctogenic properties than have the "tans." Moreover, hide powder may absorb substances which, whatever their value for tanning hides, are of no value for the manufacture of ink, according to Dr. C. Ainsworth Mitchell, in a paper delivered in October before the British Section, *International Society of Leather Trades Chemists.*

To overcome this drawback, author devised a colorimetric process based upon the formation of a soluble violet compound by the interaction of ferrous tartrate and pyrogallol (or the pyrogallic nucleus in gallic acid or tannin), the intensity of the color of this compound being proportional to the amount of that nucleus. Method is accurate for determining gallic acid in admixture with gallotannin and for evaluating tanning materials in terms of their pyrogallic colorimetric equivalents. Total tinctogenic value of the tanning solution is first determined; tannin is then precipitated with quinine hydrochloride and the gallic acid in the filtrate determined colorimetrically, difference between the two results giving the colorimetric equivalent of the tannin.

Research has proven that gallnut tannins are not individual substances, but consist of various digallic glucosides in different stages of hydrolysis. Colorimetric factor has to be the mean of these constituents. For the tannins from Aleppo galls, for instance, the average factor is 1.85, while for Chinese gall tannin it is 2.1. For myrobalan tannin the factor is 1.2:2.14.

New Dry-Cleaning Spot Remover Formula Patented

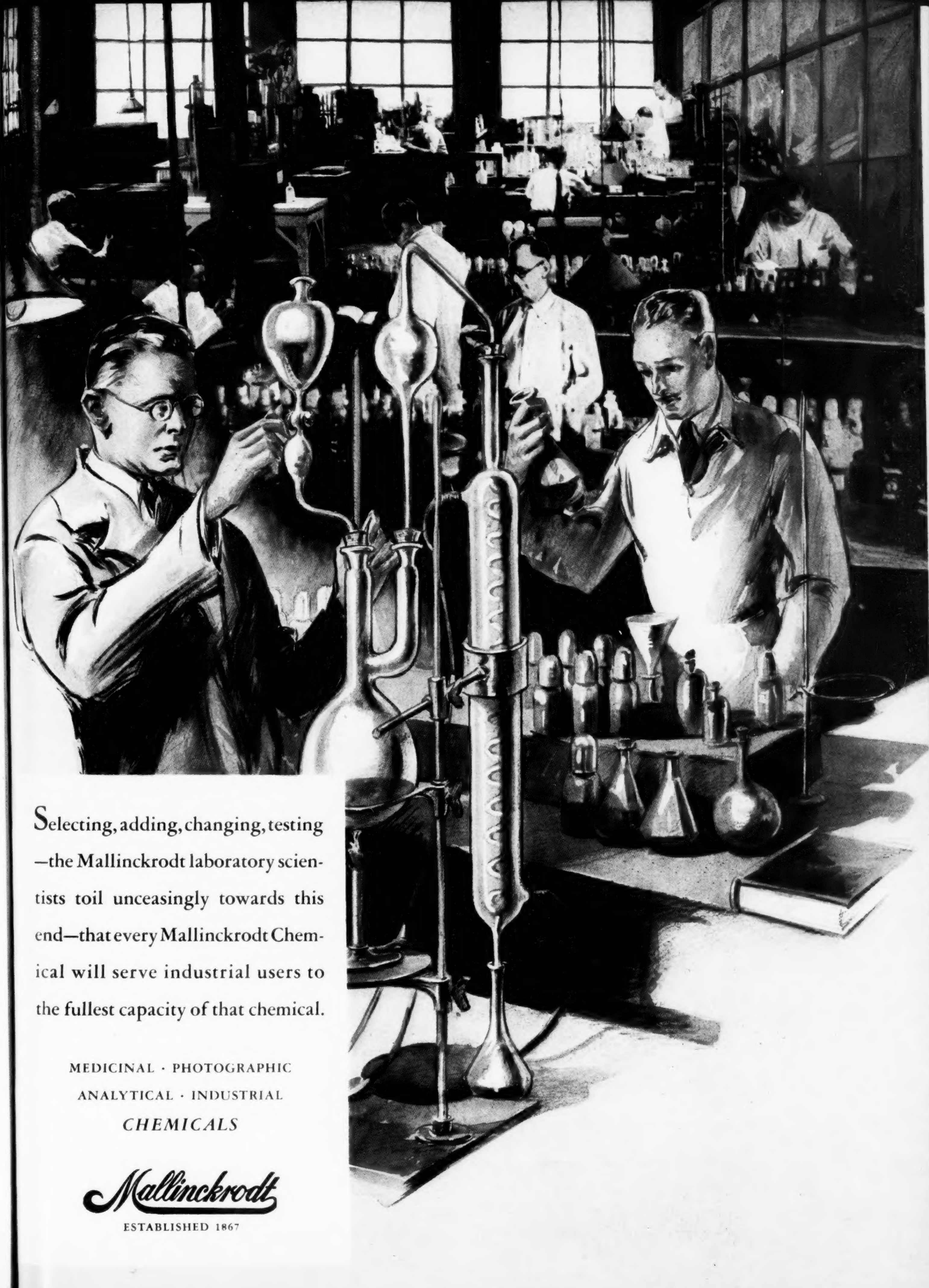
A dry-cleaning spot remover and method of application are described in U. S. Patent 2,052,891, assigned to Union Oil. A water emulsion is applied consisting of a soap composition containing an oil-soluble ethanolamine soap of a higher saturated fatty acid, an ether of ethylene glycol, and a quantity of light petroleum solvent capable of dissolving the soap and reducing the activity of the water and the glycol ether, applying to the emulsion a quantity of such soap composition in non-emulsified form for the purpose of reducing the water content of the emulsion to such a degree that it is compatible with light petroleum solvents and the like, and subsequently washing the soap mixture from the fabric with such a light solvent.

Soap Raw Materials Go Higher

Soap ingredients are soaring. Tallow, coconut oil, and palm oil have all advanced sharply in the past few weeks. Higher tallow prices are predicted upon the 3c tax on imported material and reduced supplies abroad.

New Booklet on Metal Cleaning

Detroit Rex Products, 13007 Hillview ave., Detroit, has just released a 12-page booklet "Scientific Metal Cleaning" in which the operation of modern equipment for solvent degreasing and alkali cleaning is illustrated and described.



Charged with Label Substitution

William Degnaro of Weehawken, N. J., was arrested last month charged with using counterfeit labels of well-known paint manufacturers on cans containing cheap grades.

Acme Chemical in Larger Quarters

Acme Chemical through John Halaska, vice-president, reports purchase of a larger building with a railroad siding in Milwaukee.

Cook Paint Patents a Metal Can Lacquer

Cook Paint and Varnish, Kansas City, is assignee of Patent 2,060,572 for a metal can lacquer that provides a poreless, impervious, and tasteless lining which will withstand the action of beer.

Resinates, Linoleates, and Naphthenates

Precipitated linoleates are made from a solution of a soda soap of linseed oil as neutral as possible. This soap solution, which is more conveniently made from linseed oil fatty acids rather than the oil itself, is diluted with water and introduced at a temperature of about 75° C. into an adequately capacious vat. The salt of the heavy metal used is warmed to 70° C., and added in slight excess with constant agitation. After separation in a filter press, the cakes are usually melted carefully in a steam-heated pan with the addition of a little linseed oil.

In the production of precipitated resinates, only pale grades of rosin should be employed. The saponification of the rosin should be complete, and is preferably effected under pressure. Free rosin in a drier introduces numerous difficulties. The rosin soap solution in the precipitation vat is considerably diluted with water, and treated with the heavy metal salt solution at temperatures not exceeding 50° C. After separation by filter presses, the precipitate is washed, its water content reduced as far as possible on the press, and the cake dried in a vacuum stove. The drying process is not simple owing to the readiness with which surface oxidation occurs. Lead and cobalt resinates offer greater difficulties in drying than does manganese resinate.

For the production of precipitated naphthenates, naphthenic acids pale and odorless as possible and free from mineral oil should be used. The acid is saponified with the calculated quantity of soda lye, and any mineral oil that may be present is skimmed off the surface of the solution. The solution is then precipitated, for instance, with cobalt sulfate. The precipitate is rapidly washed with hot water, and after well draining dried in vacuum at 130° C. F. Fritz, *Chemiker-Zeitung*, Nov. 11th, digested in British, *The Chemical Trade Journal*, Nov. 20th, p438.

New British Fireproofing Product

Imperial Chemical Industries, London, England, has just announced a new fireproofing compound for use on wood and paper. Product known as "Faspos" is available in 3 types: No. 1 for general purposes and interior fireproofing, No. 2 for external treatment, and No. 3 for brush or spray treatment of erected timber. All three are applied in the form of solutions in water, and their basic constituent is mono-ammonium phosphate, the decomposition of which is responsible for their fireproofing effect. They have the property of rapid penetration and a positive fungicidal action. Both the solutions themselves and the products of their decomposition by fire are non-poisonous and non-irritant.

Automotive Specialties

Seal-Fast Corp. in New Plant

Robert M. Bowes, president of Bowes "Seal-Fast" Corp. of Indianapolis, manufacturers and distributors of automotive products, announces purchase of the building formerly occupied by Indianapolis Varnish and Paint, at 147 N. Pine st. This transaction marks the 3rd major expansion undertaken by the Bowes Seal-Fast Corp. in the last 18 months.

Commercial Solvent's Anti-Freeze Radio Program

"Saturday Evening Serenade," a program of popular and light concert music presenting an orchestra conducted by Joseph Gallicchio, and Bill Hay, famous radio announcer, made its debut over WMAQ, Saturday, Oct. 24th, at 7:15 p.m., EST, and will be heard weekly. Program, sponsored by Commercial Solvents, on Nor'way Anti-freeze, features two veterans of radio in the persons of Hay and Gallicchio.

The program, which is to run for 8 weeks, was arranged for by Henry W. Denny, advertising manager for Commercial Solvents.

Agricultural Specialties

Barium Carbonate's Insecticidal Properties

Barium carbonate as an insecticide for the control of the Mexican bean beetle is discussed by L. M. Peairs, *Jour. Econ. Ent.*, 29 (1936), No. 3, p584.

Sticker for Derris Developed

In laboratory work aimed at the development of a suitable sticker for derris when used as an insecticide spray for control of the Japanese beetle, several oils, waxes, resins, agar-agar, and other materials were tested on glass plates and the most promising then tested on bean foliage. Rosin residue, the residual material left in the still during the manufacture of rosin, when emulsified with ammonium caseinate was found to be the most satisfactory and inexpensive sticker for derris. L. D. Goodhue, W. E. Fleming, *Jour. Econ. Ent.*, 29 (1936), No. 3, p580.

Thiocyanate for Red Spider Control

Laboratory and field tests reported have demonstrated that β butoxy β' thiocyanodiethylether at 1:800 when properly emulsified and used with a spreader successfully controls the common red spider. Tests conducted under field conditions on the European red mite on apples indicate that β butoxy β' thiocyanodiethylether at 1:2,400 when properly emulsified and used with a spreader gives good control. The thiocyanate may be used with lime-sulfur or flotation sulfur to make a combination contact insecticide and fungicide. Preliminary tests indicate that the thiocyanate at 1:800 will destroy about 70% of the eggs of the red spider. Further work must be done on this phase of the problem. D. F. Murphy, *Jour. Econ. Ent.*, 29 (1936), No. 3, p606.

Studies in Sulfur Spraying

A contribution from the Oregon State College gives a semi-popular outline of work in which for all types of tins the effect of sulfur spraying of the fruit in reducing the degree of vacuum in the tins was greatest in the case of thiosulfates. Sulfites and elementary sulfur showed a less marked effect. The type of container also affected the results. *Canning Age*, 17 (1936), No. 2, p72, E. H. Wiegand.

Discussion of Scab Control Methods

A contribution from the Ohio Experiment Station gives a general discussion of the spray materials and formulas and other factors important for success in the control of scab. *Ohio State Hort. Soc. Proc.*, 69 (1936), p43.

Toxic Value of Pyrethrum Reviewed

Results of an assay of the toxic value of pyrethrum flowers from various sources, in which 5-day-old houseflies were used and the sprays were prepared by extracting the ground flowers with kerosene at the rate of 1 lb. per gal., are reported. *Jour. Econ. Ent.*, 29 (1936), No. 3, p605.

Packaging, Handling and Shipping

Factors to Consider in Packaging

"Packages That Live" is the title of an article appearing in the November issue of *Printers' Ink Monthly* by Ben Nash in which the author states: "There are today 4 essentials of good packaging, 4 factors that will make the package a powerful contributing force to the modern merchandising plan.

"Factor 1. The package must be flexible.

"Factor 2. The package must assume more selling responsibility than heretofore.

"Factor 3. Competitive factors are being leveled, hence the proposition at the point-of-sale must be given greater consideration.

"Factor 4. Make a closer tie-up between packaging, selling plans, advertising, etc.

"Without attempting to cover the many ways to change or enliven the package, here are a few that I believe are important:

1. Make the package become a display item instead of a shelf item.
2. Make it easier for the consumer to inspect the contents before purchasing.
3. Make a striking visual change in the package form, color, material or text matter.
4. Create a visual change through the addition of an announcement, statement or tie-up with current advertising copy to give the package a lift and a new importance.
5. Add package attachments (this can be done either by the manufacturer or the retailer) to attract special attention. These include cut-out arrows, blue ribbon strips, etc.
6. Make a seasonal change in either the complete packaging or with an over-wrap device or attachment.
7. Change the package so the product will be more convenient to use or keep.
8. Create combination packages with a logical collection of products.
9. Change the package so as to deliver the product in a more appetizing condition and so it will continue to look appetizing after it has been partially used.
10. Create new packages with a distinctive appeal to special markets, for special uses, for specialized departments.
11. Create packages which have secondary uses for the housewife. This can be done most effectively if the change does not mean a prohibitive premium added to the retail price.
12. Develop ideas and devices which attract children, such as pictures, puzzles, cutouts.
13. Liven up package inserts by making frequent changes.
14. Consider package coupons, contents and returnable package tops if permitted by the industry."

I. C. C. Refuses Permission to Raise Rates Jan. 1st

The I. C. C. on Nov. 19th refused to grant the petition of the railroads for modification of outstanding rate orders and for Fourth Section relief to enable them to post higher permanent tariffs as a partial offset to the expiration of freight rate surcharges Jan. 1st "upon the mere assertions and replies thereto," but ruled that the case should be further heard before it is finally determined.

Initial Hearing First Week of January

Commission set Jan. 6, '37, as the date for the initial hearing for the purpose of receiving testimony from the railroads in support of their petition, to be held before Commissioner Aitchison, and subsequent hearings will be announced later. It is understood that all ancillary and connected applications under the 4th and 6th sections of the act will be heard at the same time.

Faced with the total elimination of the surcharges on Jan. 1st, the railroads may now petition the Commission for permission to extend the surcharges temporarily, until a decision is finally reached on the matter of permanent rate increases.

Commission listed 3 reasons why the petition of the railroads for a drastic revision in rates should be further heard before it is finally determined:

1. The modifications desired would amount to the abrogation of the maintenance clauses of the orders and it is believed that such action should not be taken except after proposals of the rail carriers.
2. The expense to the carriers of publishing tariffs and supplements merely embodying the rate changes outlined in exhibit 2 and the expense to the commission of preparing and serving suspension orders relating to the rate changes would be very great, and the labor involved might serve no useful end, and
3. The decision of the multitude of investigation and suspension proceedings within the maximum suspension period would impose an administrative burden which can be avoided by the course herein indicated.

Whys and Wherefores of Carboys

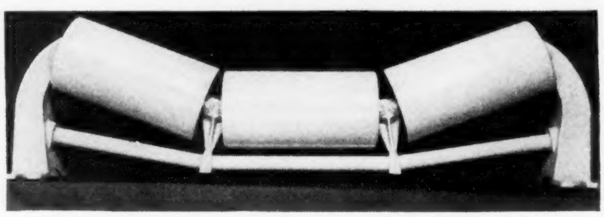
Methods of handling carboys to assure the greatest possible degree of safety are discussed by R. W. Lahey, packaging expert of American Cyanamid. Author not only explains the most satisfactory method of handling carboys, but deals at length with their construction, filling procedure, repairs, etc. *Chemical & Metallurgical Engineering,* November, '36, p598.

Handling Chemicals Cause the Most Accidents

Only 13.5% of accidents in the chemical industry are caused by contact with chemicals; 26% are caused by handling objects, such as barrels and cases; 18% are caused by falls; and 11% by machinery. Paper read by Reul C. Stratton, supervising chemical engineer, Travelers Insurance Co., before the Baltimore meeting of the A. I. Ch. E.

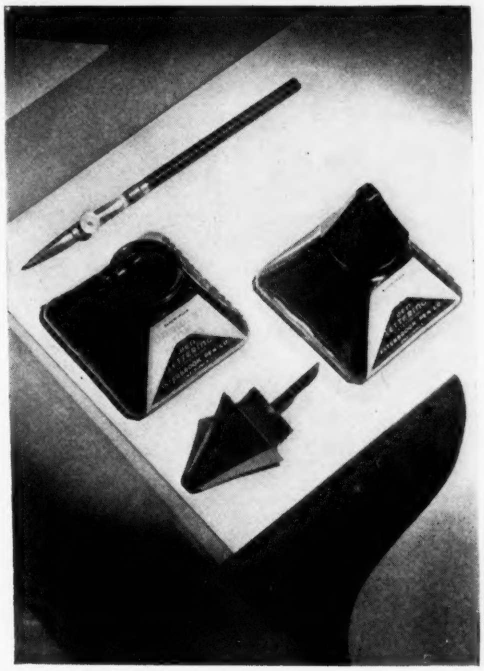
Belt Conveyor Carrier of New Design

A new "truss-frame", sealed ball bearing, belt conveyor carrier, that is "light, strong and comparatively inexpensive", is of the 3-roll in line design with outer rollers inclined to give the belt a 20° trough. Whole roller assembly is tilted to center the belt without guide rollers and particular effort has been made to produce a carrier that would minimize wear and tear on the conveyor belt. All parts are made of steel and malleable iron. Built in sizes for 18″ to 48″ wide belts. Stephens-Adamson Mfg. Co., Aurora, Ill., is the maker.



A carrier which minimizes wear and tear on conveyor belts.

New Products—
New Packages



For years drawing-ink bottles were just drawing-ink bottles. Now, all of a sudden, there is keen competition in the design of particularly attractive containers. Here's Esterbrook's contribution to the appearance of the artist's drawing board. Molded of acid-resistant Durez by American Insulator Corp.

Feiner Chemical, Springfield, Mass., employs a Phoenix lithographed cone-top can for its Rub-Less Metal Polish, a cleaner and polish for all solid and plated metals. Contains no acid or grit, and is non-flammable.

E. R. Squibb & Sons' fine chemicals and pharmaceuticals are now offered in dignified amber, octagonal bottles of uniform size and capacity, capped with a modern jet-black Bakelite molded screw closure. Labels are printed on waterproof paper and may be dusted and washed without injury.

Rubber cement several years ago was used solely for repairing tubes. Today it finds many uses in home, office, and studio. The container is a Phoenix cone-top can, lithographed.

A very unusual design of container has been adopted by Shell for its family of household specialties. One advantage is the firm grip made possible by the ribbed sides. Owens-Illinois' designers are responsible.

FERRISUL

(Anhydrous Ferric Sulphate)

A booklet will be furnished on request

MERRIMAC CHEMICAL COMPANY

EVERETT STATION BOSTON, MASS.

A Subsidiary of

Monsanto Chemical Company

ST. LOUIS, U.S.A.

NEW YORK • CHICAGO • CLEVELAND • BIRMINGHAM • SAN FRANCISCO • MONTREAL

OTHER MONSANTO WATER-TREATING CHEMICALS

•

- Sodium Aluminate
- Alum
- Liquid Chlorine
- Anhydrous Sodium Sulphate
- Santosite

New Trade Marks of the Month

370,703
GYCOTAN

372,592
FER-O-TEX

374,067
METALLURGICAL PRODUCTS COMPANY
HERCULES

374,068
METALLURGICAL · PRODUCTS CO.
GIBRALTAR

374,994
ACZOL
WOODS LIFE SAVER

375,184

376,019
LIN-O-VNEER

376,243
Exeller

376,284
ZEPH

376,619
-P-A-F-

376,673.
CALICO

377,189
MENNEN

377,271
GULF

378,643
BLUE BEARD

378,936
QUIXOL

378,968
SAND BANUM

379,091
EGGSACT

379,150
MILO

379,403
DINO

379,766
MAGNESIA SPELLEGHINO

Trade Mark Descriptions†

370,703. Geigy Co., N. Y. City; Oct. 23, '35; chemicals for tanning; use since Sept. 27, '35.

372,592. Faust-Booth Paint Co., St. Louis; Dec. 13, '35; paints and enamels; use since '23.

374,067. Israel W. Wilenchik (Metallurgical Products Co.), Philadelphia; Jan. 24, '36; metals, metal castings and metal alloys; use since Jan. 1, '33.

374,068. Israel W. Wilenchik (Metallurgical Products Co.), Philadelphia; Jan. 24, '36; metals, metal castings and metal alloys; use since Jan. 1, '33.

374,994. Zinsser & Co., Hastings-on-Hudson, N. Y.; Feb. 18, '36; wood preservative; use since Apr. 14, '08.

375,184. Weirton Steel Co., Weirton, W. Va.; Feb. 24, '36; tin plate; use since Feb. 14, '36.

376,019. Vita Var Corp., N. Y. City; Mar. 14, '36; paints, etc.; use since Dec. 21, '35.

376,243. Max Heller (Exeller Chemical Co.), N. Y. City, Mar. 21, '36; various chemicals and drugs; use since June 1, '32.

376,284. Leland H. Kimball, Salt Lake City; Mar. 23, '36; core and foundry sand binders; use since Mar. 6, '36.

376,619. Howard E. Bagnall (Bagnall Co.), Kansas City, Mo.; Mar. 31, '36; poisons and poisoned seeds to exterminate rodents and pests; use since Feb. 11, '36.

376,673. V. H. Greffoz, Houston, Tex.; Apr. 1, '36; metal and shoe polishes, and scrubbing powder; use since Feb. 11, '36.

377,189. The Mennen Co., Newark, N. J.; Apr. 14, '36; soap; use since Mar. 10, '29.

377,271. Gulf Oil Corp. of Pa. (Gulf Oil Corp.), Pittsburgh; Apr. 16, '36; petroleum products; use since Oct., '20.

378,643. Bectin-Seymour, N. Y. City; May 20, '36; shaving creams and powders; use since May 15, '36.

378,936. Commercial Solvents Corp., N. Y. City; May 27, '36; industrial solvents; use since Dec. 13, '35.

378,968. American Sand-Banum Co., N. Y. City; May 28, '36; boiler scale compounds; use since Feb. 1, '36.

379,091. Thor Holland, Seattle; June 1, '36; sensitizer base for use in photo engraving, etc.; use since Feb. 22, '36.

379,150. R. R. Street & Co., Chicago; June 1, '36; dry cleaning soap; use since '07.

379,403. Sinclair Refining Co., N. Y. City; June 6, '36; paints, enamels, primers, and thinners; use since Apr. 1, '36.

379,766. Saprochi S. A., Geneva, Switz.; June 15, '36; magnesia; use since Apr. 1, '36.

Chemical Specialty Patents*

Process for photo-ink printing. No. 2,058,396. Elton N. Baker, Chicago.

Mirror surface whose composition lies between the limits 98% aluminum and 2% magnesium, and 92% aluminum and 8% magnesium. No. 2,058,429. Hiram W. Edwards, Los Angeles, Calif., to Don Baxter, Inc., Glendale, Calif., as trustee for Frederick M. Turnbull, Don Baxter, Inc., Hiram W. Edwards, and L. H. McGowan.

Device for removing water, tar, etc., from the nonaqueous sealing liquid used in a waterless gas holder. No. 2,058,459. Konrad Jagschitz, Mainz, Ger., to Maschinenfabrik Augsburg-Nuernberg A. G., Nuremberg, Ger.

Coatings for cedar receptacles. No. 2,058,571. Ernest C. Crocker, Belmont, Mass., to The Lane Co., Va.

Insecticide comprising an insect poison and a carrier containing an emulsified unneutralized heterocyclic nitrogenous oily base. No. 2,058,588. Carl P. Hopkins, to The Latimer-Goodwin Chemical Co., both of Grand Junction, Colo.

Process for plasticizing soap with 1% to 20% naphtha. No. 2,058,781. Carleton Ellis, Montclair, N. J., to Standard-I. G. Co.

Lubricating compound containing a low viscosity mineral lubricating oil, sodium naphthenate, 1 to 5% pine oil and about 2% water. No. 2,058,788. Waldersee B. Hendry, Beacon, N. Y., to The Texas Co., N. Y. City.

Waterproofing composition for concrete containing water soluble sulfonic derivatives of petroleum. No. 2,058,821. Edward B. Peck, Mannheim, Ger., to Standard Oil Development Co., Del.

Preparation of insecticides by treating plants containing rotenone and other insect poisons with a petroleum distillate containing an organic solvent. No. 2,058,832. Nicholas A. Sankowsky, New Providence Township, Union County, N. J., to Stanco, Inc.

Viscous hydrocarbon oil blend for use in shock absorbers. No. 2,058,899. Leo D. Jones to Sharples Specialty Co., both of Philadelphia.

Cementitious material containing cement of the Sorel type and finely divided copper. No. 2,058,984. Dean S. Hubbell to H. H. Robertson Co., both of Pittsburgh.

Cement resulting from the treatment of partially calcined dolomite containing a small amount of lime and finely divided copper with magnesium chloride solution. No. 2,058,985. Dean S. Hubbell to H. H. Robertson Co., both of Pittsburgh.

Cement resulting from the treatment of partially calcined dolomite containing a small amount of lime and finely divided cuprous oxide with magnesium chloride solution. No. 2,058,986. Dean S. Hubbell to H. H. Robertson Co., Pittsburgh.

Cementitious material containing cement of the Sorel type and finely divided cuprous oxide. No. 2,058,987. Dean S. Hubbell to H. H. Robertson Co., both of Pittsburgh.

Soap-free metal-tarnish remover consisting essentially of "thiocyanate gas liquor" free from soluble sulfides. No. 2,059,052. Frederick W. Sperr, Jr., Vineland, N. J.

Joining material for insulated cables consisting of albumen-free rubber, deresinated balata, wax and polymerization products of aryl olefines. No. 2,059,055. Ernst Studt, Nordenham, Oldenburg, Ger., to Norddeutsche Seekabelwerke A.-G., Nordenham, Oldenburg, Ger., to Norddeutsche Seekabelwerke A.-G., Nordenham, Ger.

Method of termite control. No. 2,059,095. Evan L. Fellman to E. L. Bruce Co., both of Memphis, Tenn.

Insecticide comprising principally ortho-dichlorobenzene and a volatile petroleum solvent, and also alcohol, *B*-naphthol and rosin. No. 2,059,125. Frank H. Lyons to E. L. Bruce Co., both of Memphis, Tenn.

Fire kindler consisting of a vegetable fibrocellular material saturated with a hydrocarbon-containing inflammable material. No. 2,059,208. Franklin V. Chaney to Pine Kindler Corp., N. Y. City.

Compounds resulting from the reaction of urea and ethylene oxide which have emulsifying, wetting, and dispersing properties. No. 2,059,273. Henry Alfred Piggott, Blackley, Manchester, Eng., to Imperial Chemical Industries Limited, Gt. Brit.

(Specialty Patents continued on next page.)

* Patents covered in this issue include those appearing in the *U. S. Patent Gazettes*, October 27 to November 17.

† Trade-marks reproduced and described cover those appearing in the *U. S. Patent Gazettes*, October 27 to November 17.

Specialty Patents (Continued)

Sealing composition of white lead, linseed oil, and suspended paraffine particles. No. 2,059,409. Fred Stevens to American Cast Iron Pipe Co., both of Birmingham, Ala.

Washing compound containing crystals of a water-softening agent such as borax which carry a blue water-soluble dye. No. 2,059,449. Albert A. Fowler, North Hollywood, and Russell M. Otis, Pasadena, Calif.

Aluminum solder consisting of 60% tin, 25% cadmium, 7.5% silver, and 7.5% aluminum. No. 2,059,496. J. Hugo Smith, Detroit, Mich.

Lubricant comprising a mineral lubricating oil containing up to 0.4% chromium oleate, up to 0.1% tin oleate and up to 0.1% tetra-ethyl lead. No. 2,059,567. Elliott Alfred Evans to C. C. Wakefield and Co. Limited, both of London, Eng.

Process for softening water with a water soluble salt of tetraphosphoric acid. No. 2,059,-570. Augustus H. Fiske, Warren, and Charles S. Bryan, Providence, R. I., to Rumford Chemical Wks., Rumford, R. I.

Soil conditioner consisting of 40 to 70 mesh coal which has been roasted between 300 and 400° F. No. 2,059,599. Charles Peter, Salt Lake City, Utah.

Soil conditioner consisting of roasted 40 to 70 mesh coal and rock salt ground to 120 mesh. No. 2,059,600. Charles Peter, Salt Lake City, Utah.

Composition for preventing the corrosion of metals. No. 2,059,770. Anton Bopp, Heilbronn-on-the-Neckar, Ger.

Fire resistant material composed of spaced thin metal sheets separated by metallic silicate. No. 2,059,801. Harvey B. Lindsay, Evanston, Ill.

Method of purifying sulfonic soaps produced by the reaction of fuming or concentrated acids on a mineral oil. No. 2,059,838. Maurice H. Arveson, Highland, Ind., to Standard Oil Co. (Ind.), Chicago.

Method of lubricating a composition bearing containing a phenol-formaldehyde resin, by use of a polyhydroxy alcohol. No. 2,059,856. Eugene C. Eastman, Whiting, and Edward R. Barnard, Hammond, Ind., to Standard Oil Co. (Ind.), Chicago.

Cleaner for metal surfaces comprising metal particles having the composition: 0.125% carbon; 0.37% manganese; 0.044% sulfur; 0.012% phosphorous; 0.11% silicon; and 99.339% iron. No. 2,059,915. John E. Ruch, Barberton, Ohio.

Hydraulic pressure fluid containing 5% to 20% glucose, 5 to 20% glycerine and 75% of an equal mixture of alcohol and water. No. 2,060,110. Burton Paxton to Chicago Hydraulic Oil Co., both of Chicago.

Assisting agents for the textile industry. No. 2,060,568. Charles Grawnacher and Richard Sallmann to Society of Chemical Industry in Basle, all of Basel, Switz.

Tile and concrete binding plastic consisting of water, sodium salicylate, sodium carbonate, calcium hydroxide, trisodium phosphate, casein, sulfated castor oil, sulfur, zinc oxide and Vultex. No. 2,060,677. Joseph Labra, Long Island City, N. Y.

Flux coating for a welding electrode consisting of 24% feldspar, 18% ilmenite, 14% asbestos, 9% metallic deoxidizer, 28% liquid sodium silicate, 7% water. No. 2,060,681. Virdis Miller and Joseph H. Humberstone, Schenectady, to General Electric Co., N. Y.

Flux coating for a welding electrode. No. 2,060,682. Virdis Miller and Joseph H. Humberstone, Schenectady, to General Electric Co., N. Y.

Dry cell. No. 2,060,796. Nelson C. Cahoon, Fremont, Ohio, to Union Carbide and Carbon Corp., N. Y.

Dry Cell. No. 2,060,799. Price Drummond, Rocky River, Ohio, to National Carbon Co., N. Y.

Production of multicolor-printing plates. No. 2,060,816. Robert Mackay, Chicago.

Galvanic cell. No. 2,060,818. Paul A. Marsal, Lakewood, Ohio, to Union Carbide and Carbon Corp., N. Y.

Dry cell. No. 2,060,832. Ralph R. Smith, Fremont, Ohio, to Union Carbide and Carbon Corp., N. Y.

Welding flux comprising sodium borate, a paste material and a powdered non-ferrous alloy composed chiefly of cobalt, chromium and tungsten. No. 2,060,948. Samuel R. Oldham, Chicago, to Union Carbide and Carbon Corp., N. Y.

Bituminous emulsions. No. 2,061,076. Lester Kirschbraun to The Patent and Licensing Corp., both of N. Y. City.

Waterproofing concrete by application of a layer of fabric included between layers of a water emulsion of asphalt which contains rubber latex. No. 2,061,098. Arthur A. Johnson, Great Neck, N. Y., to Johnson-March Corp., Del.

Specialty Patents concluded on next page.

379,831 SAVO

379,992 PROTECTO CLEANER PROTECTS

380,017 CRYSTALAC

380,099 OTTO Eilert's

380,198 Garden-Pak

380,495 PINETEX

380,538 ESTACO

380,675 PALITE

380,747 CHEMO-VAC

380,496 CARBOSEAL

380,371 RANGILAX

380,954 SINCO

381,105 Fuelite

381,110 SUPER THERMO

381,111 THERMO ROYAL

381,181 MERITOL

381,184 BOOSTER MOTOR OIL

381,218 STORMY WEATHER WATERPROOFING

381,303 Micrometric

381,325 HAMMER BRAND

381,401 STARLUBE

381,475 Bon Ami

381,588 2100

381,589 3100

381,590 3200

381,593 T SOAP

381,658 LAPIDESCENT

Descriptions

379,831. The Cuyahoga Merchandising Co., Cleveland; June 17, '36; cleaning compound; use since Aug. '35.

379,992. Jack D. Nicholas, St. Joseph, Mo.; June 22, '36; automobile, furniture, and floor cleaner; use since May 1, '35.

380,017. Paper Makers Chemical Corp., Wilmington, Del.; June 20, '36; mixtures of resins and waxes for coating paper and board; use since June 12, '36.

380,099. Otto Eilert, Cleveland; June 23, '36; preparation for treatment of printing plates; use since May 1, '36.

380,198. Gen. Chem. Co., N.Y. City; June 25, '36; insecticides & fungicides; use since May 8, '36.

380,495. Frank George Bolte, Jr., Audubon, N. J.; July 2, '36; household cleaner; use since Feb. 1, '36.

380,538. Esta Co., Reading, Pa.; July 2, '36; gasoline, lubricating oils and greases; use since May 28, '35.

380,675. Sinclair Refg. Co., N.Y. City; July 6, '36; turbine lubricating oil; use since June 13, '36.

380,747. Ralph Bell, San Fran.; July 8, '36; chemicals indicating presence of carbon dioxide, carbon monoxide, etc.; use since Mar. 24, '36.

380,498. Carbide and Carbon Chemicals Corp., N. Y. City; July 2, '36; glycol compositions for swelling jute, etc., for pipe joints packings in gas distribution systems; use since Dec. 18, '36.

380,371. The Walpamur Co., London, Eng.; June 27, '36; paints and corrosion preventative paints; use since May 24, '36.

380,954. G. M. Lewis Chemical Co., Canton, Ohio; July 13, '36; household detergent; use since Apr. 2, '36.

381,105. Fuelite Oil Treating Corp., Chicago; July 15, '36; chemical compound for fuel oils; use since June 30, '27.

381,110. Publicker Commercial Alcohol Co., Philadelphia; July 17, '36; radiator anti-freeze; use since Sept. 16, '35.

381,111. Publicker Commercial Alcohol Co., Philadelphia, Pa.; July 17, '36; radiator anti-freeze; use since Sept. 18, '35.

381,181. Whittemore-Wright Co., Charlestown, Mass.; July 18, '36; oils for genl. cleaning, fatliquoring, & finishing leath.; use since July 1, '36.

381,184. Windsor-Lloyd Products (Booster Chemical & Engineering Co.), Baltimore, Md., and Wilmington, Del.; July 18, '36; lubricating oils; use since July 1, '36.

381,218. Protection Products Mfg. Co., Kalamazoo and Detroit, Mich.; July 20, '36; fabric waterproofing agents; use since May 15, '36.

381,303. F. S. Webster Co., Cambridge, Mass.; July 21, '36; carbon paper; use since Apr. '33.

381,325. Societe Generale Des Ciments Portland De L'Escaut, Societe Anonyme, Autoing, Belgium; July 22, '36; Portland cement; use since Jan. 1, '96.

381,401. Carman & Co., N. Y. City; July 24, '36; starch lubricant for laundry use; use since July 7, '36.

381,475. The Bon Ami Co., N. Y. City; July 27, '36; cleansing powder; use since Oct. 11, '35.

381,588. Una Welding, Cleveland; July 29, '36; welding rod and wire; use since Sept. 1, '33.

381,589. Una Welding, Cleveland; July 29, '36; welding rod and wire; use since Oct. 1, '35.

381,590. Una Welding, Cleveland; July 29, '36; welding rod and wire; use since June 1, '35.

381,593. Voorhis-Tiebout Co., Rhinebeck, N. Y.; July 29, '36; soap; use since Jan. 2, '36.

381,658. Bradley & Vrooman Co., Chicago; July 31, '36; paint; use since May 29, '36.

381,659
SANISYN

381,700
ALL ready

382,701
ALL solv

381,702
ALL special

381,783
Royal Cross

381,821
E-CON-O

381,823
RUSTTOX

381,833
G T A

381,869
BLUE SEAL

381,971
AULA

382,072
ROTOXOLENE

382,092
Double Action

382,150
VANEX

382,302
SUNIE

382,339
AMACEL

382,416
AMASOL

382,428
VISCOLIZED

382,538
ESOTAN

382,575
BULL DOG

382,576
Stanley's LILAC SOAP

382,579
CELUTATE

382,637
Mobilane

382,658
KLEERPANE

382,681
K-CEMO

382,698
RUSTEX

382,776
CEDARLAST

382,789
NEVERSLIP RUG DRESSING

382,814
ST-115

Descriptions

381,659. Bradley & Vrooman Co., Chicago; July 31, '36; lacquer for food containers; use since July 2, '36.
381,700. Allied Industrial Alcohol Corp., N. Y. City; Aug. 1, '36; denatured alcohol and radiator anti-freeze; use since May 11, '36.
381,701. Allied Industrial Alcohol Corp., N. Y. City; Aug. 1, '36; denatured alcohol; use since May 11, '36.
381,702. Allied Industrial Alcohol Corp., N. Y. City; Aug. 1, '36; denatured alcohol; use since May 11, '36.
381,783. Rex Pharmacy, Seattle; Aug. 3, '36; various chemicals, insecticides, etc.; use since Mar. 28, '35.
381,821. Royalton Face Brick Co., Middletown, Pa.; Aug. 4, '36; cellular bricks; use since June 1, '36.
381,823. The Skybryte Co., Cleveland; Aug. 4, '36; rust inhibitor; use since Apr. 1, '31.
381,833. Gunnlaugur Tryggvi Athelstan (Athelstan Products Co.), Minneapolis, Minn.; Aug. 5, '36; rodent and vermin poisons; use since Jan. 15, '30.
381,869. Illinois Farm Supply Co., Chicago; Aug. 6, '36; lubricating oils; use since Apr. 8, '27.
381,971. Henry Deutinger, N. Y. City; Aug. 10, '36; pickling salt; use since May 1, '36.
382,072. R. J. Prentiss & Co., N. Y. City; Aug. 12, '36; insecticides; use since June 1, '36.
382,092. H. Clay Glover Co., N. Y. City; Aug. 12, '36; insecticide; use since July 31, '36.
382,150. Murray J. Bliss (Glass-Glow Co.), Indianapolis, Ind.; Aug. 14, '36; cleaner and polisher for glass; use since June 27, '36.
382,302. George Joseph Basel (Basel Co.), Cleveland; Aug. 18, '36; shaving soap and cream; use since June 6, '36.
382,339. Celanese Corp. of America, N. Y. City; Aug. 19, '36; dyestuffs; use since July 24, '36.
382,416. American Aniline Products, N. Y. City; Aug. 21, '36; for textile fiber dyestuffs; use since July 8, '36.
382,428. Growers Supplies, Harlingen, Tex.; Aug. 21, '36; sulfur; use since Jan. 30, '36.
382,538. Virginia Smelting Co., West Norfolk, Va.; Aug. 24, '36; tanning compound; use since May 1, '36.
382,575. John T. Stanley Co., N. Y. City; Aug. 25, '36; soap; use since 1893.
382,576. John T. Stanley Co., N. Y. City; Aug. 25, '36; soap; use since 1875.
382,579. Zinsser & Co., Hastings-on-Hudson, N. Y.; Aug. 25, '36; dyestuffs; use since Aug. 12, '36.
382,637. Socony-Vacuum Oil Co., N. Y. City; Aug. 27, '36; liquid petroleum gases; use since July 15, '36.
382,658. D. A. Collins Mfg. Co., Brooklyn, N. Y.; Aug. 28, '36; window cleaner; use since Oct. '35.
382,681. U. S. Gypsum Co., Chicago; Aug. 28, '36; priming paint; use since Dec. '35.
382,698. Elliott Paint & Varnish Co., Chicago; Aug. 28, '36; paints, enamels, and varnishes; use since Jan. '32.
382,776. Standex Corp., Los Angeles; Aug. 31, '36; moth-proofing water paint; use since June 8, '36.
382,789. Earle J. De Golier (Neverslip Dressing Co.), Bradford, Pa.; Sept. 1, '36; dressing to prevent slipping of rugs; use since Sept., '35.
382,814. Tennessee Eastman Corp., Kingsport, Tenn.; Sept. 1, '36; ethyl alcohol denaturant; use since July 3, '36.

Specialty Patents (Concluded)

Manufacture of gelatin reliefs for printing. No. 2,061,230. Walter Frankenburger and Georg Rossler, Ludwigshafen-on-the-Rhine, Ger., to I. G., Frankfort, Ger.

Bath soap containing an alkali metal salt of a sulfuric acid ester of a higher aliphatic alcohol, and 10% by weight of lanolin, wool fat or higher aliphatic alcohols. No. 2,061,468. Walter Kling, Chemnitz, Ger., to H. Th. Bome A. G., Chemnitz, Ger.

Bleachable Printing Ink

A chemical means of removing inks from old newspapers and periodicals so that the paper might be used again has been the subject of research in Germany for many years. Being unsuccessful in finding a process that would remove lampblack inks, attention was turned to the preparation of an ink which could be easily bleached. Reports from Frankfort-on-Main indicate such an ink has now been developed and that eventually it may be adopted by the entire German printing industry.

Metal Surface Cleaner

A phosphoric acid base metal cleaner, known as "Metalprep" which removes oil, grease, waxes, rolling compounds and other foreign matter from the surface of metal in such manner as to leave the surface chemically clean and ready for paint, has been developed by the Neilson Chemical Co., Detroit, Mich. It is said to remove rust rapidly and completely and to inhibit the rusting agents which caused rust to form originally, or which might set up new rust under the prime or surface coat. Due to the penetrative properties of its solvent, even where rust is not entirely removed, "Metalprep" penetrates into the pit holes and to the base of the rust, thus stopping further rust development.

Grease from Drain Pipes

Large scale recovery of grease from drain pipes for use in the manufacture of soap and for other industrial purposes is being seriously considered in Germany as a part of its new 4 year plan, according to reports to the Commerce Dept's. Chemical Division from the American Consulate, Frankfort-on-Main.

Boston Blacking Changes Name

Boston Blacking & Chemical has become the B. B. Chemical Co. and factories in Middleton, Mass., and in Cambridge and elsewhere will hereafter be known by the shorter name.

382,621
CHAMBERLIN ROCK WOOL
HOME INSULATION

383,089
"TERMINIZED"

382,851
PROTOZYME

382,887
READY-TO-CLEAN

382,881
GRANGER "77"

382,955
Polystal

382,984
HORMODIN

383 030
SOY-O-CIDE

383,054
EM

383,073
EM-PRO-LAC

383,074
ADHEROL

383,075
SPEEDKUT

383,076
TOOLIFE

383,099
HORMOZIN

383,158
BOJAY

383,177
NICHOLS
Z-O
COPPER FUNGICIDE

383,181
ROCK-A-BYE BABY

383,194
KOR-KOR

383,339
OILIQUID

383,364
LUPOMATIC

383,370
PERMACAST

378,434
HI-SPEED

383,435
DART

383,570
COLT

383,777
CANTERBURY HOUSE

383,782
FULL DRESS

383,816
NAPZOL
CLEANING
CRYSTALS

Descriptions

382,821. Chamberlain Metal Weather Strip Co., Detroit; Sept. 2, '36; rock wool; use since May 21, '36.

383,089. Newton P. Easling, Pekin, Ill.; Sept. 10, '36; insect proofing paint; use since March, '36.

382,851. Jacques Wolf & Co., Passaic, N. J.; Sept. 2, '36; enzyme for decomposition and conversion of starches and for proteins and their removal from textiles; use since May 11, '36.

382,887. Ready-Jell Mfg. Co. (R.J. Mfg. Co.), Troy, N. Y.; Sept. 3, '36; household detergent; use since Aug. 1, '36.

382,881. Gustave Napoleon (Napco Products Co.), Trenton, N. J.; Sept. 3, '36; insecticide; use since Jan. 2, '36.

382,955. I. G., Frankfort, Germany; Sept. 5, '36; adhesives containing artificial resins; use since Dec., '35.

382,984. Merck & Co., Rahway, N. J.; Sept. 3, '36; chemicals for plant growth stimulation; use since Aug. 31, '36.

383,030. Nowak Milling Corp., Hammond, Ind.; Sept. 8, '36; live stock spray; use since Aug. 25, '36.

383,054. Electro Metallurgical Co., N. Y. City; Sept. 9, '36; ferro-alloy briquets; use since Jan., '32.

383,073. The Sherwin-Williams Co., Cleveland; Sept. 9, '36; paints, enamels, lacquers, etc.; use since Aug. 14, '36.

383,074. Specialty Products Co., Jersey City; Sept. 9, '36; lubricating oils; use since Aug. 25, '36.

383,075. Specialty Products Co., Jersey City; Sept. 9, '36; lubricating oils for cutting tools; use since Aug. 25, '36.

383,076. Specialty Products Co.; Jersey City; Sept. 9, '36; lubricating oils for cutting tools; use since Aug. 25, '36.

383,099. Merck & Co., Rahway, N. J.; Sept. 10, '36; chemicals for plant growth stimulation; use since Sept. 1, '36.

383,158. J. Jay Bickel (Master Shaving Cream Co.), Minneapolis; Sept. 12, '36; shaving cream; use since June 10, '32.

383,177. Nichols Copper Co., N. Y. City; Sept. 12, '36; fungicide; use since June 5, '36.

383,181. Rock-A-Bye Co., N. Y. City; Sept. 12, '36; silks for infants; use since Aug. 30, '33.

383,194. The Kor-Kor Paint Co., Grand Rapids, Mich.; Sept. 8, '36; paints, enamels, varnishes, etc.; use since June 15, '36.

383,339. Whittemore Bros. Corp.; Cambridge, Mass.; Sept. 16, '36; leather dressing; use since Aug. 7, '36.

383,364. Lupomatic Tumbling Machine Co., N. Y. City; Sept. 17, '36; tumbling, burnishing, and polishing compounds and polishing creams; use since Dec., '33.

383,370. The Reliable Pattern & Castings Co., Cincinnati, Ohio; Sept. 17, '36; aluminum and bronze castings; Apr. 22, '36.

378,434. Hickok Oil Corp., Toledo; May 14, '36; fuels, lubricants, and greases; use since Sept. 15, '17.

383,435. S. H. Kress and Co., N. Y. City; Sept. 19, '36; auto top dressing, polishes, soaps, cleaners, etc.; use since Nov. 1, '32.

383,570. Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.; Sept. 24, '36; containers and closures made of synthetic resins; use since '31.

383,777. McKesson & Robbins, Bridgeport and Fairfield, Conn., Sept. 29, '36; soap; use since Feb. 11, '36.

383,782. Maurice E. Proctor (Proctors Products Co.), New Haven, Conn.; Sept. 29, '36; shaving cream; use since Sept. 19, '36.

383,816. Parfums Duvee, N. Y. City; Sept. 30, '36; cleaner for fabrics, dishes, and floors; use since June 19, '36.

Park Chemical Celebrates

Park Chemical, Military and Vancouver aves., Detroit, manufacturer of case-hardening chemicals and other industrial specialties for steel-treating, is celebrating its 25th anniversary.

W. P. Woodside has been the firm's president during its entire existence, and N. J. Bourg has been its vice president for 20 years. Today the company employs on an average of 60 people and maintains a branch office at Los Angeles, Calif., and export office in Cleveland, O.

Obtains Temporary Injunction

Mifflin Chemical Co., Delaware ave. and Mifflin st., Philadelphia, nearly lost its permit to manufacture rubbing alcohol last month. Revocation of the license was to become effective Dec. 1st but the company obtained on Nov. 29th a temporary restraining order from Judge Oliver B. Dickinson.

The Internal Revenue Department at Washington announced the revocation of the permit and charged that Mifflin agents instructed purchasers how to "crack" the rubbing alcohol and make it potable.

The decision by Stewart Berkshire, Deputy Commissioner of Internal Revenue, upheld the action of Edward Dougherty, Alcohol Tax Unit Supervisor of the Philadelphia district.

Insecticide Efficiencies

The Fertiliser, Feeding Stuffs and Farm Supply Journal, British, Nov. 18th, p675, contains an article entitled "Derris Root and Allied Insecticides." Author discusses methods of evaluating their insecticidal efficiency and the relative effectiveness of the powder and liquid extract.

Lanaetex Reorganized

Lanaetex Products Sales Corp., Box 52, Station A, Elizabeth, N. J., is now marketing the lanolin produced by the reorganized Lanaetex Products, Inc. William M. Driesen is now in charge of production. He has had over 25 years experience in this country and Germany in the manufacture of lanolin.

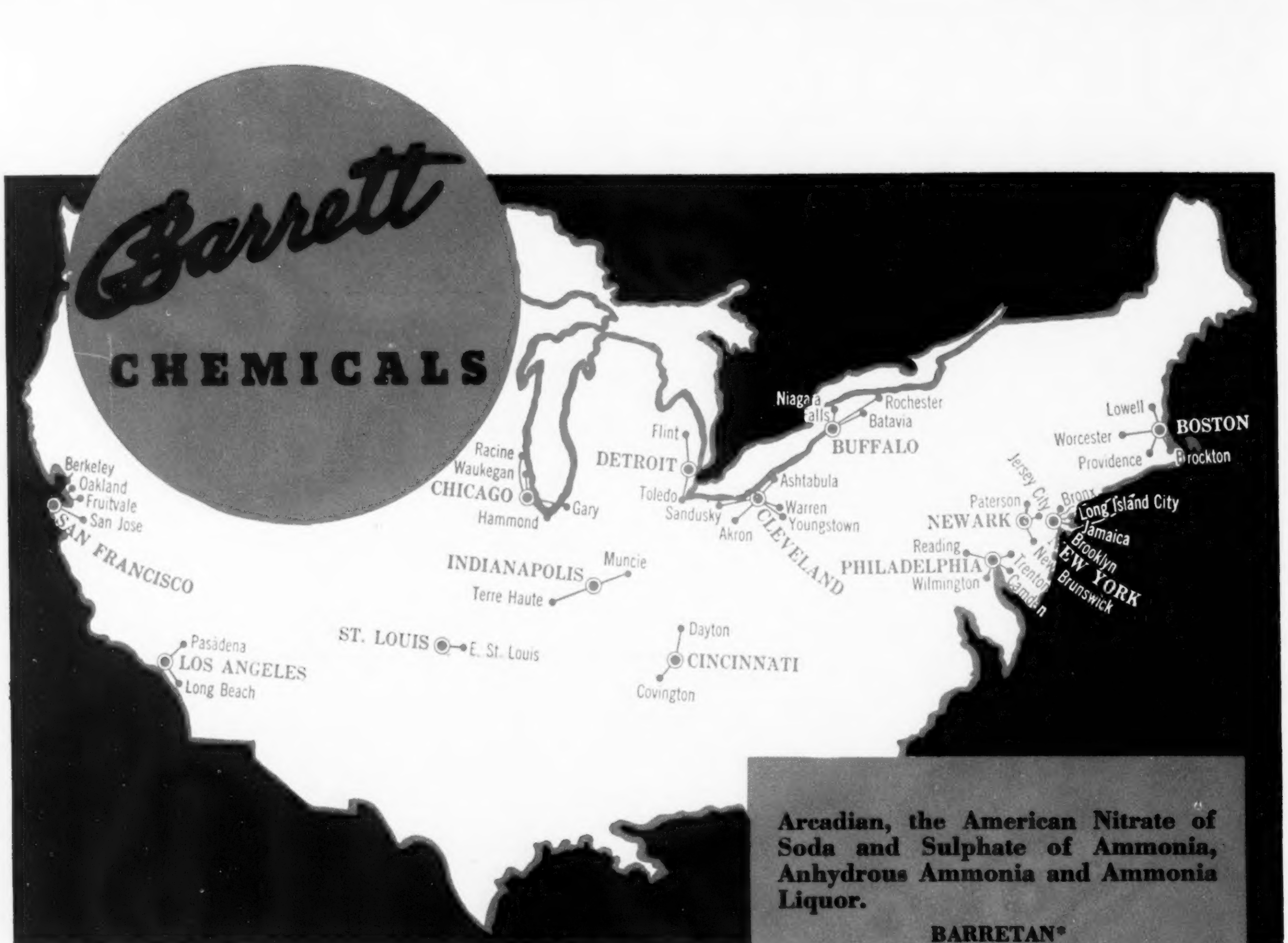
Johnson to Expand

S. C. Johnson & Son, paint and chemical specialty manufacturer, Racine, Wis., will erect a most unusual office building. Building will be of orange brick and will have no windows. It will be equipped with glass floors and with indirect lighting, while an air-conditioning unit will maintain the same constant temperature at all times.

CHEMICAL

NEWS & MARKETS

Wilson I. Doan becomes the manager of Dow Chemical's new Chicago office.



Arcadian, the American Nitrate of Soda and Sulphate of Ammonia, Anhydrous Ammonia and Ammonia Liquor.

BARRETAN*

BENZOL
Pure and 90%

CHLOR META XYLENOL

CRESOLS
U.S.P., Refined Ortho, Meta and Para
Special Fractions

CRESYLIC ACID
Straw Color and Dark

CUMAR*
Paracoumarone-indene Resin

FLOTATION OILS and REAGENTS

HI-FLASH NAPHTHA

HYDROCARBON OIL

NAPHTHALENE
Crude, Refined Chipped, Flake, Ball and Nugget

PARA-CHLOR-META CRESOL

PHENOL (Natural)
U.S.P. 39.5° M. Pt. and 40° M. Pt.
Technical 39° M. Pt.
Technical 82-84% and 90-92%

PICKLING INHIBITORS

PICOLINES

PYRIDINE
Refined, Denaturing and Commercial

QUINOLINES

RUBBER SOFTENERS

SHINGLE STAIN OIL

SOLVENT NAPHTHA

SPECIAL HEAVY OIL

TAR ACID OILS

TOLUOL

XYLENOLS

XYLOL

* Reg. U. S. Pat. Off.

Tank Wagon Service on BENZOLS, TOLUOL and XYLOL

If you are located within a radius of fifty or sixty miles of the thirteen industrial centers from the Atlantic to the Pacific Coast, shown on the map above, you can save money and time by having Barrett Benzols delivered in express tank wagons direct to your own storage. Deliveries to more distant points may be arranged upon request. Phone, wire or write for details.

THE BARRETT COMPANY
40 Rector Street, New York, N. Y.

THE TECHNICAL SERVICE BUREAU of The Barrett Company invites your consultation with its technically trained staff, without cost or obligation. Address The Technical Service Bureau, The Barrett Company, 40 Rector Street, New York.

WAGE BOOSTS, BONUSES REPORTED

DuPont, Carbide, Calco, Dow, and Others Grant Increases to Plant Workers — Hercules, Monsanto, and Atlas Will Give Bonuses—Chemical Industry's Labor Record is Outstanding

Leading companies in the chemical and allied fields were well in the forefront last month in the movement of industry to grant higher wage scales and bonuses to workers. Among the concerns announcing wage increases were: du Pont, Carbide, Calco, Hercules, and Dow. Included in those distributing special bonuses were: Atlas Powder, Monsanto, and Standard of N. J. This list is not complete, but does serve to show how widespread the intention is on the part of chemical executives to deal fairly with labor.

duPont to Meet Local Conditions

General managers of the du Pont Co's. various interests are considering upward adjustments of wage rates to meet conditions in the localities where plants are situated. The first increase was announced at Richmond, Va.

L. S. Munson, general manager of the du Pont dye works at Deepwater Point, N. J., announced later in the month that payroll employees would be given a wage increase up to 5c per hour, effective Nov. 22nd.

Carbide and Dow Announcements

Wage increases approximately 7% were ordered last month for nearly 2,400 employees of Carbide at South Charleston.

Company also announced that henceforth it will pay time and a half for all time worked in excess of an 8-hour day. This means that although the plant operates on a 40-hour basis the time and a half would apply only when men work more than 8-hours in a single day. Only employees paid on the hour basis will be affected by the wage increase, officials of the South Charleston plant report.

Dow Chemical announced on Dec. 3rd a general wage adjustment which will raise the pay of its 3,000 employes from 44 to 50c an hour.

Other increases announced last month included: increases of as high as 10% in some cases at the plant of Naugatuck Chemical; a 5% boost affecting all Calco employees whose hourly or monthly wage totals less than $2,500 annually; increases ranging between 6 and 8% at the Hercules' New Brunswick, N. J. plant; and a 11½% wage increase for employees of the Huntington, W. Va., plant of International Nickel.

Companies Granting Bonuses

Monsanto's board of directors has ordered payment of one week's pay to all employees not working under other incentive plans and who have been continuously employed by the company or its American subsidiaries for a year or more; also a proportionate part of one week's pay for those in employ less than one year.

Atlas Powder on Nov. 23rd announced a Christmas bonus, based on a sliding scale, to 2,000 employees in service prior to Nov. 1, 1936 and who are earning less than $400 a month.

The Standard bonus is in the form of a recommendation by directors to subsidiaries and affiliates. Where adopted it will result in credit of one week's pay to the account of employees participating in the company's thrift plan, plus as much as they have subscribed, while the small percentage not subscribing will receive a credit of one week's pay under the plan at no cost to themselves. About 47,000 employes in the U. S. will be immediately affected.

Eastman Gives "Wage Dividend"

A "wage dividend" of $2,200,000 has been voted by Eastman Kodak directors for distribution to employees March 1, 1937. Each employe who has completed 5 years of service, explained a company official, will get a check for 4 times his average weekly wage.

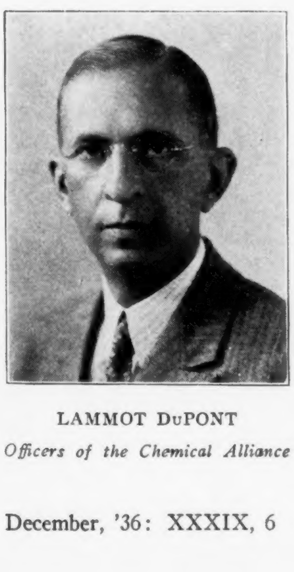
The chemical industry's record during the depression on the matter of employment and wage scales has been an outstanding one. At the very worst of the depression when General Johnson was asking for a 40-hour week and a 40c per hour wage it was discovered that over 90% of the chemical workers were paid upon this or a better basis.

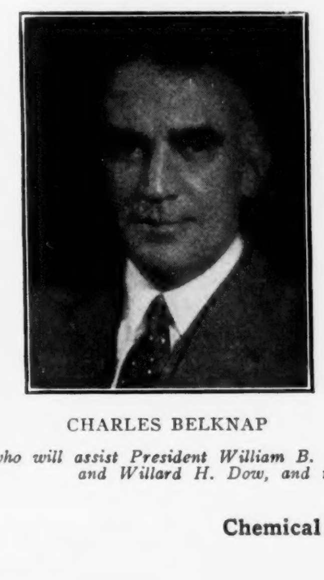
In a subsequent study made early in the current year by the Chemical Alliance it was shown that 134 establishments, with 39,646 employees, maintained both the wage and hour provisions of the defunct NRA, while only 40 firms, employing but 6,003 persons, conformed in neither. Twenty-seven firms, employing 5,848 persons, conformed to the wage provisions but not hours; seven, with 2,190 workers, maintained maximum hours but no minimum wages.

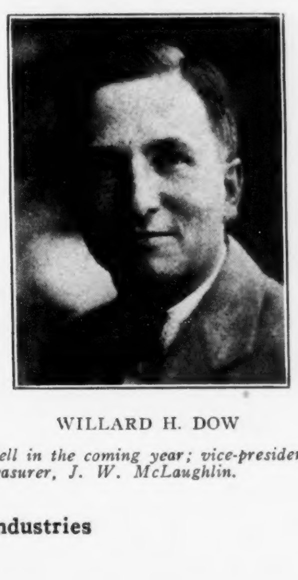
Largest classification within the chemical and related products group is for chemical plants. Out of a list of 68 firms with 24,175 employees 41 companies with 19,126 workers conformed to NRA wages and hours although the measure had been declared unconstitutional several months previously.

A study of the payroll and employment indices of the Dept. of Labor discloses the enviable position of workers in the chemical field as compared with those in other groups.

	Oct. 1936	
	Employment	Payrolls
(3-year average 1923-25 = 100)		
Chemicals and allied products, and petroleum refining	118.3	111.9
Other than petroleum refining	119.5	112.7
Chemicals	122.5	120.3
Explosives	99.6	100.9
Fertilizers	87.8	84.3
Paints and varnishes	115.1	105.2
Rayon and allied prods.	367.7	291.5
Soap	108.8	107.7
Petroleum refining	113.4	109.4
All industries	92.1	86.5
Durable goods	84.1	81.3
Non-durable goods	100.7	93.3


LAMMOT DuPONT


CHARLES BELKNAP


WILLARD H. DOW


J. W. McLAUGHLIN

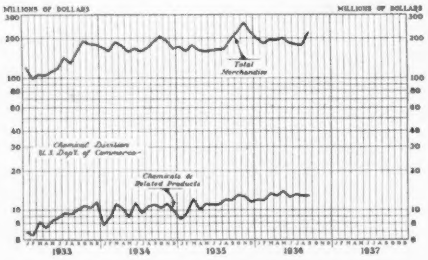
Officers of the Chemical Alliance who will assist President William B. Bell in the coming year; vice-presidents, Lammot duPont, Charles Belknap, and Willard H. Dow, and treasurer, J. W. McLaughlin.

Exports Up 16%; Imports 25% Above Last Year

Spectacular Increases in Exports of Sulfur, Benzol, and Potash—Naval Stores Shipments Increase $1,179,400 in First 9 Months—Exports for First 3 Quarters Total $114,000,000, as Against Imports of $112,000,000 — Effect of Currency Devaluation Abroad Analyzed—

Chemical exports todate are up 16% over last year and more than 50% above the corresponding period of '33. Imports during the current year have increased 25%. Spectacular increases have been recorded in export shipments of sulfur, benzol, fertilizer—particularly potash—and a number of specialty items.

Aggregate value of chemical exports during the first three quarters of the current year totalled $114,000,000, preliminary figures show, which compares with $98,000,000 during the corresponding period of last year.



U. S. exports of general merchandise and exports of chemicals and related products are shown graphically.

Exports of industrial chemicals and chemical specialties, not including sulfur, attained the value of $31,473,000 in the '36 period compared with $27,000,000 during the first three quarters of last year. Specialty lines which increased in value from $9,595,000 to $14,794,000 accounted for the gain, analysis shows.

Foreign demand for American fertilizer materials has been particularly active. Shipments of all types during the first 9 months aggregated 1,287,055 tons, valued at $13,750,000 compared with 1,032,840 tons, valued at $9,769,600, in the first three quarters of last year. Export shipments of potash materials almost doubled during these periods, quantity increasing from 44,166 to 83,772 tons while the value received increased from $1,206,850 to $2,646,200.

Foreign demand for paint materials, particularly ready mixed products, has also been active, with shipments of such products going to almost every country of the world. Aggregate value of such exports reached $13,000,000 in the first three quarters compared with $11,801,000 for the same months last year. Shipments of ready mixed paints, varnishes and lacquers increased from 2,771,500 gals. to 3,078,000 gals; mineral earth pigments from 39 to 46 million lbs; chemical pigments, including carbon black, from 119 to 128 million lbs; and kalsomine from 210,000 to 281,400 lbs.

Shipments of naval stores, gums, and resins have been well maintained, total for the first 9 months reaching the value of $13,569,400, an increase of $1,179,400 over the same months of last year. In this classification value of turpentine increased from $3,988,400 to $4,228,500, and rosin from $7,560,520 to $7,949,600.

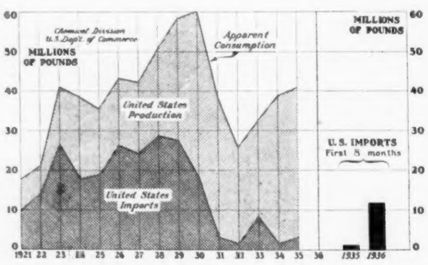
Foreign demand for sulfur has recoverd remarkably—a total of 457,064 tons, valued at $8,792,750, being shipped during the first three quarters compared with 279,174 tons, valued at $5,447,500, in the corresponding months of '35.

Imports Largely Raw Materials

Imports of chemicals, industrial oils, and related products continued at high levels in September bringing the total for the first three quarters of '36 to $112,000,000 an increase of approximately 25% compared with the corresponding period of last year. Increase was due largely to increased imports of raw and processed materials, many of which are not produced in the U. S.

There was a substantial increase in imports of industrial chemicals, total value increasing from $11,841,000 to $15,469,000, due in part to heavier receipts of camphor and glycerine, both crude and refined, crude iodine, and argols. Imports of coal-tar products aggregated $10,636,000 in value during the current 9 month period, an increase of $262,000 compared with the same months of last year. In this classification receipts of creosote oil remained at 30 million gals. but the invoice value paid increased slightly to $3,282,000.

Receipts of coal-tar colors, dyes, stains, etc., however, declined substantially from 3,516,700 lbs. to 2,768,000 lbs. in quantity and from $4,556,700 to $4,134,700 in value. As usual bulk of such imports continue to originate in Germany and Switzerland.



Shortage of casein is reflected in sharp increase in imports.

Reflecting domestic shortage, receipts of casein increased sharply from 1,377,000 lbs., valued at $118,000, in the '35 period to a total of 13,685,000 lbs., valued at $1,116,000 in the first 3 quarters of the current year.

October chemical export statistics indicate even greater gains, the shipments of $14,472,000 constituting a record that has not been attained during any month for 6 years.

"Carrying Coals to Newcastle"

"Sale of American coal tar dyes to Germany, and cosmetics to France, carries a suggestion of exporting coal to Newcastle. But the fact that such export sales, along with many others almost equally striking, are now commonplace occurrences, indicates the remarkable development of recent times in American chemical research and production," states H. Lawrence Groves, chief business specialist of the Dept. of Commerce.

"It wasn't so many years ago that our chemical products cut a minor figure in international trade. Even in the immediate pre-war years exports of chemicals from this country were far exceeded by our imports in this line—(1910 exports about $60,000,000, imports $100,000,000; 1913 exports $79,000,000, imports $123,000,000).

"Today the situation is reversed—shipments to our customers abroad substantially over-top our chemical imports (1933 exports $107,000,000, imports $85,700,000; 1934 exports $124,000,000, imports $96,000,000). It is a fact of more than passing significance that our manufacturers were able in 1934 to sell $400,000 worth of dyes and other coal tar products in the Netherlands, in the immediate face of German competition, and even in that year to sell $166,000 of these products in Germany itself—the home of coal tar products; in the same year (the latest for which complete figures are available), we sold $973,000 of synthetic nitrogenous fertilizer to France, $404,000 to Spain, $214,000 to Denmark, despite the European nitrate agreement allocating markets among participating countries, including Chilean production. Our exportation of $500,000 worth of toilet soap and preparations to India in 1934, along with $1,200,000 worth of medicinal preparations, shows the strength of our export manufacturers in that highly competitive market of the Orient."

Foreign Devaluation

The American chemical industry, which obtained a $136,000,000 share out of the $681,500,000 world market in chemicals last year, stands to lose a good part of that export trade as a result of currency devaluation in European countries, according to a survey made by the *N. Y. Journal of Commerce.*

U. S. at a Disadvantage

The nations which have depreciated their currencies—France, Holland, Switzerland and Czechoslovakia particularly—are all competitors in the foreign chem-

ical markets with American manufacturers and, further assisted by cartelization and by quota arrangements, may be able to place the U. S. industry at a considerable disadvantage, is the consensus of opinion of executives interviewed.

Germany Maintains Position

Germany's chemical trade during the past 5 years has amply demonstrated the ability of that country to maintain its chemical export business in periods of varying world trade conditions, a report received by the Commerce Dept's. Chemical Division from the American Consulate, Frankfort-on-Main, indicates.

Both the volume exported and the value received during the first 3 quarters of the current year were higher than in the same months of '35 and compare favorably with the record for similar periods since '31. Value of Germany's chemical exports during the first 9 months of '36 approximated $199,082,000 compared with $190,013,000 recorded in the corresponding period of '35 and the volume increased from 2,515,037 metric tons to 2,521,534 metric tons.

Gain was the result of marked advances in certain of the principal chemical groups, particularly in foreign shipments of coal-tar products, heavy chemicals, nitrogen fertilizers, organic synthetic dyes, and explosives.

Exports sales of potash, however, declined somewhat, the contraction in shipments of processed products being more pronounced than with manure salts.

Important Customs Rulings

France has suspended the import quota system on the following products: Ammonium chloride; ammonium carbonate and bicarbonate; crude and refined iodine; the iodides of ammonium, lithium, potassium, sodium and strontium; artificial cryolite; boric acid; hydrogen peroxide; chromic acid; molybdic acid and molybdates; acetyl salicylic acid; tanning extracts; ethylene glycol; natural abrasives; hydrated lime; writing and drawing inks; and certain types of boot and shoe polishes and creams.

There is a strong possibility that Japan will shortly increase the import duty on caustic and ash. Impression in the trade is that the present duty on caustic will be doubled, and that on ash trebled. At present, caustic soda, refined, is dutiable at 17.28 yen per 100 kin, while ash is dutiable at 0.47 yen per 100 kin.

The temporary trade agreement which was signed by Canada and Germany on Oct. 22nd is expected to increase competition between German and American chemical products in the Canadian market, particularly in medicinal, drug, and coal-tar dye lines.

Steam distilled pine oil may be used hereafter in the denaturing of vegetable oils as required for free entry under Par. 1732 of the tariff, according to amended regulations announced by the Customs Bureau. Special mineral denaturing oil of proper specifications also may be used as heretofore providing it is easily recognizable by its disagreeable taste and odor. Such denatured oils may be used only for mechanical or manufacturing purposes.

German Chemical Wages Pegged at '32 Levels

"Labor Trustees" Fear Effect on Production Costs and Foreign Market — Japan May Not Renew Pact with Nitrogen Cartel—New Foreign Alkali Plants—Ando Reports on Conditions in Japan—

Wage rates in the German chemical industry continue pegged at approximately depression lows of '32 though some relatively slight increases have occurred in total weekly earnings in some branches where the number of working hours have been increased. Wage increases, notwithstanding steady rising tendencies in the cost of living, have been generally refused by the "Labor Trustees" on the grounds that such action would tend to increase production costs and render the exportation of German goods more difficult.

Jap. Sulfate Trade in Doubt

With the approach of the date for the enforcement of the Japanese Staple Fertilizer Industrial Control Law, ammonium-sulfate trade circles are wondering what is to be the future of the present agreement between Japan and the European Nitrogen Convention, whereby Japan is empowered to export 60,000 tons of sulfate and to import 120,000 tons. This agreement, which has been renewed annually since 1931, will, it is thought, most probably be abandoned with the enforcement of the new Law.

Additional Alkali Tonnages

I. C. I. has registered a new subsidiary company at Melbourne, with nominal capital of £2,000,000 to make alkalies. New company will begin operations at Port Adelaide. Leases of extensive salt and limestone areas around St. Vincent gulf have already been obtained.

New Jap. Electrolytic Plant

Despite over-production of caustic in Japan, new producers continue to appear. Latest is the Japanese Tar Industry Co., Ltd. (Nippon Tar Kogyo K.K.), which recently increased its capital sixfold. This company is erecting a large electrolytic-alkali plant, the main object being to secure independence in supplies of chlorine necessary for dyestuffs manufacture.

Rosenthal Host to I. Ando

H. H. Rosenthal, president of the well-known N. Y. City firm of H. H. Rosenthal & Co., was host last month to I. Ando, manager of the Chugai Boyeki Co. of Osaka. Mr Ando made his headquarters at Mr. Rosenthal's office at 25 E. 26th st. The Boyeki Co. is one of the largest factors in industrial chemicals, dyestuffs, and intermediates in Japan and the Rosenthal Co. is its exclusive buying and sales representative in the U. S. Two years ago Mr. Rosenthal spent several months in Japan and the Far East.

In an exclusive interview with a CHEMICAL INDUSTRIES' reporter, Mr. Ando reported that the Japanese chemical industry is making rapid strides in the erection of new plants and that business conditions are very satisfactory.

Foreign Developments Briefly Told

The Italian Government has approved plans for a plant to produce glycerine from beet sugar residues. Vinyl acetate is now being made in two Japanese plants by condensation of ammonia with carbon dioxide. Recently formed coal hydrogenation company in which the Japanese Government, the South Manchurian Railway and various other industrial companies are participating, will commence activities with a capital of 100,000,000 yen.

Japan is expected to have an exportable glycerine surplus next year. Domestic consumption of about 8,000 metric tons is almost wholly taken care of domestically. Sales of all producers with 3 exceptions, are handled by the Glycerine Sales Co. Japanese chlorine producers are finding difficulty in marketing a chlorine surplus, and Nippon Soda K. K. is to make benzoyl chloride and benzyl cellulose.

The Nippon Seiren K. K. is increasing its monthly bichromate output from 7,000 to 10,000 metric tons and its chromic acid production from 60 to 100 metric tons; from May 1st to Aug. 31, '36 orders for French potash increased 30%; Japan is to take between 5,000 to 7,000 metric tons of Chilean nitrate monthly through to June, '37; in 26 years Chile (through '35) has exported 52,499,251 metric tons of nitrate with the U. S. taking 19,697,455 tons; French North African phosphate exports during the first 7 months of '36 totalled approximately the same as those for the corresponding months of '35, but Tunisia accounted for a larger share of the business in early '36.

Catalin, Ltd., has been incorporated in London by a British group headed by J. C. Inglesby, who will be chairman and managing director, to serve as sales agent for the Catalin Corp. of America pending construction of a plant at Waltham Abbey.

Nitrate shipments from Chile in the 3rd quarter of '36 were 223,863 metric tons, and for all 9 months of 1936 were 1,012,-

374 tons, more than 84% of which was shipped from Tocopilla and Iquique. Largest amounts went to the U. S., Europe, and Egypt.

Regulations placing the manufacture of fertilizers in Japan under the Major Industry Control Law have been announced and became effective on Nov. 15th. Among other things the law requires producers to report production quotas and sales prices 30 days in advance of the effective period.

Canadian Industries has started shipments of trichlorethylene from a new plant. The British Colour Council has approved 8 colors for use in the textile and other industries preparing materials for the Coronation celebration next May. The British dye industry is operating at the greatest activity in its history.

A new Venezuelan law prohibits the manufacture, importation or sale of fertilizers, insecticides, fungicides, and concentrated animal feeds except under prior permit issued by the Dept. of Agriculture. Hereafter containers of such materials must be labeled or stamped showing analysis of contents.

Patent Diamond Jubilee

Dawn broke over Washington on Nov. 24th with no complaints from 1,000 scientists and officials who drank gallons of hair tonic, according to Associated Press reports to the newspapers.

The novel cocktail—composed of corn liquor, port wine and black currants—was the introductory course to a banquet celebrating the 100th birthday of the American patent system.

Twenty-seven years ago Inventor Friedrich Wilhelm Emil Muller received patent number 511,659 for his "hair-growing" concoction. In using the above-named composition, Muller said in his application for a patent, "A small quantity should be rubbed into the scalp several times daily."

As a blast of bugles announced the opening of the banquet the guests nervously fingered the bottles and delicately tapered glasses before them.

"Bottoms up," shouted a man at the end of the hall.

The diners sipped a little and then fell to examine the patent attached to the bottle.

"By the use of the above composition," they read, "hair may be made to grow on bald spots of the head where hair should ordinarily grow."

Finally, amid laughter, one guest after another downed the cocktail.

Dr. Charles F. Kettering, toastmaster, who was scheduled to predict the next 100 years of science by gazing into antique crystal balls lent by Pierre S. du Pont, instead looked at his audience and said: "The boundless future is the territory in which we may work."

Secretary of Commerce Roper, speaking at the dinner, acclaimed the American method of granting patents as a model of "standard practice for the entire world."

"Our patent development is indeed the marvel of the world," he said. "It is evident to me that there are yet many undiscovered frontiers, as well as many further developments in known fields, awaiting the exploration of inventive genius. These are destined to reveal marvels of comfort and convenience yet unknown."

Tracing the importance of inventions to civilization, Harrison E. Howe, editor of *Industrial and Engineering Chemistry*, told the afternoon session, held in the auditorium of the National Academy of Arts and Sciences, that the patent system was a system of "inciting invention." Wealth, education, increased population, industrialization and commercial organization were necessary to it.

Corporate Structures

¶Diamond, Allied, National Lead Join Procession of Companies Rearranging Former Subsidiaries

In last month's issue the general trend on the part of a number of companies in the chemical and allied fields to simplify their corporate structures through the absorption of existing subsidiaries was analyzed and several outstanding examples given.

During November additional companies announced elimination of subsidiaries with the subsequent formation of such subsidiaries as divisions of the parent concerns.

The Standard Chromate Co., one of the producers of bichromates, is now operating as a division of Diamond Alkali, and will be known as the Standard Chromate Division of the Diamond Alkali Co. The business will be handled by the same personnel as in the past and the policies of the former company will be maintained. The Prior Chemical Corp., 420 Lexington ave., N. Y. City, continues as the sole selling agents for "Standard" bichromates.

Atmospheric Nitrogen Dissolved

Allied Chemical has announced changes in the corporate set-up of its nitrogen-producing subsidiaries. Under the new plan Atmospheric Nitrogen has been dissolved and its assets, consisting principally of the nitrogen fixation plant at Hopewell, Va., have been transferred to Solvay Process, another wholly owned subsidiary of Allied. For some time past the operations of the Hopewell plant have been conducted by Solvay.

This change will not in any way affect the operations of this branch of the company's business. The nitrogen products produced at Hopewell will continue to be marketed through the Barrett Co., another Allied subsidiary.

National Lead's Changes

The Titanium Pigment Co. was dissolved Oct. 31st, and, effective Nov. 2nd, a new selling organization, known as the Titanium Pigment Corp., a subsidiary of National Lead, was organized under the laws of the State of New Jersey, to act as the sole sales agent for "Titanox" pigments. Manufacture of "Titanox" pigments will be carried on by the National Lead Co., Titanium division, operating plants at St. Louis and Sayreville, N. J.

The officers of the new corporation are:—President, Ralph M. Roosevelt; vice-president, C. F. Garesche; secretary-treasurer, F. H. Dow; assistant secretary-treasurer, A. L. Hoffman; general sales manager, I. D. Hagar; eastern sales manager, G. W. Corddry; western sales manager, D. W. Edgerly.

Standard Silicate a Diamond Division

Standard Silicate (silicates) was dissolved as of Nov. 30th. Assets and business are now owned and operated by Diamond Alkali. Executive and sales offices will be maintained at the same location as heretofore. All correspondence should be handled as in the past except that it should be addressed to the Standard Silicate Division, Diamond Alkali Co., Pittsburgh, Pa. Business will be in charge of the same personnel as in the past and the policies of the former company will be continued.

COMING EVENTS

N. Y. Group, Rubber Division, A.C.S., Xmas Party, Building Trades Club, 2 Park ave., N. Y. City.

Seventh National Organic Chemistry Symposium, Richmond, Va., Dec. 28-30.

Third Chemical Engineering Symposium, A. C. S., Columbia University, Dec. 28-29.

National Association of Dyers and Cleaners, 30th Annual Convention, Netherland-Plaza Hotel, Cincinnati, Ohio, probably Jan. 25-28, '37.

Technical Association of the Pulp and Paper Industry, Feb. 22-25.

American Society for Testing Materials, Regional Meeting, Palmer House, Chicago, Mar. 1-5, '37.

12th Annual Drug, Chemical and Allied Trades Banquet, Waldorf-Astoria, N. Y. City, Mar. 4.

American Ceramic Society, Annual Meeting, Waldorf-Astoria, N. Y. City, week of Mar. 21, '37.

12th Southern Textile Exposition, Textile Hall, Greenville, S. C., Apr. 5-10, '37.

American Chemical Society, 93rd Meeting, Chapel Hill, N. C., Apr. 12-15, '37.

International Association for Testing Materials, 2nd International Congress, London, Apr. 19-24, '37. K. Headlam-Morley, 28 Victoria st., London, S. W. 1.

American Society for Testing Materials, 40th Annual Meeting, Waldorf-Astoria, N. Y. City, June 28- July 2, '37.

"Achema VIII," Plant exhibition, in connection with 50th General Meeting of Verein Deutscher Chemiker, Frankfurt, Germany, Sept., 1937.

American Chemical Society, 94th Meeting, Rochester, N. Y., Sept. 6-10, '37.

Exposition of Chemical Industries, Grand Central Palace, N. Y. City, Dec. 6-11, '37.

LOCAL TO NEW YORK*

Dec. 11, Joint meeting, technical societies.
Dec. 18, American Institute of Chemists.
Jan. 8, Perkin Medal Award.

* At the Chemists' Club unless otherwise noted.

Wilson & Bennett Mfg. Holds Sales Convention

New Developments in Containers Explained to 50 Salesmen—Koppers to Construct 59 Coke Ovens for Inland Steel—Andrews Lead to Give Demonstration of Lead Burning—Ecclestone Chemical's 21st Birthday—Hercules Gives Course on Lacquer Formulation—News of the Companies—

Wilson & Bennett Mfg. Co., manufacturers of steel drums and pails, recently held its 9th sales convention in Chicago. Over 50 salesmen, representatives and executives, representing 22 cities throughout the U. S. were in attendance at the 4 day meeting.

Meetings were conducted by S. A. Bennett, president and Harry F. LePan, general sales manager. First 3 days were given over to educational discussions and the study of manufacturing procedures. Considerable time was spent in the plant studying the actual details of fabrication and obtaining information on the various phases of construction that make these containers outstanding. Much time was also spent in the study of the practical application of various types and sizes of steel containers to different product requirements.

These containers are used extensively in the food, chemical, paint, and petroleum industries and they are being adopted continuously for new products and new uses. Accordingly, the meetings included considerable discussion on the subject of these different applications.

Company has developed and perfected several new types and styles of pails and drums during the past few years and has made many improvements in construction. All of these were studied in detail by the sales organization so that they would be better equipped to provide a specialized container service to users and prospective users.

Special protective interior linings have been developed recently which provide a perfect protection to different foods, chemicals, etc., and accordingly open up many new fields for the use of steel containers. This subject was discussed at much length.

Adds to Coal-Tar Solvents Output

Inland Steel, Indiana Harbor, Ind., has awarded Koppers Co., Pittsburgh, a contract for the erection of 59 coke ovens and for other construction and replacements at its Indiana Harbor plant. Work will start immediately and give employment to 300 men for 10 months. New low differential type Becker ovens with self-sealing doors and other modern auxiliaries, will be installed, similar to other ovens which Koppers is now constructing for other firms. The ovens are equipped so that they can be fired with blast furnace gas.

The Inland Steel's benzol and by-product plants will be remodeled with modern equipment for the production of pure benzol, toluol, xylol, and all grades of solvent naphtha. Improvements to the company's coal and coke handling equipment are included in this contract.

See Chemical Lead Burning

On Friday, Dec. 18th, at 2 P.M., a demonstration will be held at the plant of the Andrews Lead Co. at 30-48 Greenpoint ave., Long Island City. Company has arranged to have expert men from its construction force present at its plant to show all the various methods and manners in which lead can be joined to lead for general construction work.

It should be remembered that lead construction is an art. As a result, there are exceptionally few qualified and skilled lead burners. Lead has been, and continues to be, one of the principal metals for industrial construction and, therefore, any instruction along the lines outlined is most informative and not readily available.

Some of the subjects covered will be, overhead burning, underhand burning, upright burning, butt joints, roll joints, homogeneous bonding, methods of strapping, etc. Company will be glad to welcome anyone interested.

21 Years of Distribution

Ecclestone Chemical's 21st birthday is being celebrated at large plant, located at 2675 Guoin st., Detroit, Mich., as the company pushes its plans to double its present factory capacity. The Ecclestone Chemical Co. was founded by E. C. Ecclestone in 1915.

Company Briefs

Sun Oil, Philadelphia, has purchased the Horsehaven quicksilver mine near Ashwood, Ore. Company uses mercury in its refining process.

Foote Mineral's new grinding unit and warehouse at Wyndmoor (near Philadelphia) is nearing completion.

A course of training in the formulation of lacquers has been inaugurated by Hercules Powder, Wilmington, as a service to users of its lacquer materials. This course will run for 5 months, and it started with an enrollment of about 20 young chemists from 16 companies interested in lacquers.

General Aniline Works has moved its N. Y. City offices from 1150 Broadway to 435 Hudson st.

Blount Fertilizer, Greenville, N. C., will erect a new $50,000 plant to replace the one recently destroyed by fire.

National Oil Products acquires exclusive sales rights to distribute a new line of unique thermoplastic enamels produced by the Heresite & Chemical Co.

Fred A. Jensen, Chicago manufacturers' representative, is celebrating the anniversary of his 25th year of service to the paint industry.

V.-C. opens a new sales office at Savannah, Ga., in charge of A. T. Joiner, who will be assisted by B. A. McCown.

United Chromium filed a petition for a re-hearing and a re-argument of the case of United Chromium Inc. vs. General Motors et al., on Oct. 26th. The U. S. Circuit Court of Appeals for the 2nd Circuit has granted this petition. Case will be re-argued.

Baker Castor Oil has decided upon a wide program of expansion which is expected to triple its present personnel at the Bayonne, N. J. plant. Company is also greatly enlarging the plant.

Four men were killed and two critically injured on Nov. 5th in an explosion of a tank containing pulverized coal at Diamond Alkali's plant at Painesville, Ohio.

A. E. Starkie Co., 1645 So. Kilbourn ave., Chicago, reports that for the first time in the history of pitch a uniform, constant supply is now offered to all industries which employ pitches in their processes.

Sessions-Gifford Co., Providence, has opened a branch warehouse at 40 Water st., East Cambridge, Mass., with J. Clark Wyman, formerly of Brewer & Co. in charge.

The entire sales force of Wilson & Bennett Mfg. Co. (drums, pails, etc.), gather at the Chicago headquarters for instruction on new developments in containers made by the company's engineers and chemists.

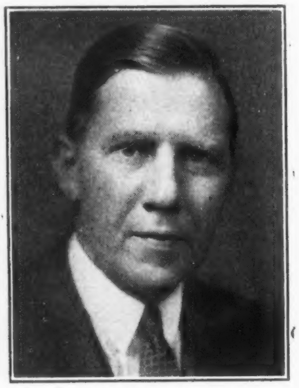
Kerm Elected President, Stanley Chemical

Avery, Prominent Metallurgical Engineer, Joins Little Organization — Sommer Placed in Charge of Standard Varnish Plants—Potash Companies Expand Sales Staffs—Other Personnel Notes—

Stockholders and directors of the Stanley Chemical Co., after meetings last month, announced the following promotions, resulting from the recent death of President William S. Rowland; New president, William J. Kerm, formerly secretary and treasurer who continues as treasurer also; vice-president and secretary, E. M. Hayden who has been in charge of technical development, research and manufacture of new items; vice-president and sales manager, Edward H. Christ, who has been sales manager. The men were also elected to the board of directors.

Expert in Plant Operation

Julian M. Avery, electro-chemical and metallurgical engineer, formerly with Union Carbide, has joined the staff of Arthur D. Little, Inc., research chemists and engineers of Cambridge, Mass. Mr.



JULIAN M. AVERY

A new consultant in the Little organization.

Avery is a graduate of M. I. T., '18, and obtained his first practical plant experience as a lieutenant in the Chemical Warfare Service under the late Colonel William H. Walker, who was one of the early partners of Dr. Arthur D. Little.

Mr. Avery brings to Arthur D. Little, Inc., a wealth of experience in practical plant operation, research developments, patent work and the investigation and evaluation of inventions and processes, acquired both in the U. S. and in Europe while serving various subsidiaries of Carbide.

Acetylene Association Meeting

Standard Varnish Works, N. Y. City, has appointed Paul Sommer director and vice-president in charge of plants. Mr. Sommer was for 15 years connected with the National Varnish Company, Long Island City, resigning his position as technical director and industrial sales manager in 1928 to organize North Bergen Varnish. He sold his interests and resigned from the presidency of that company early in 1934 and joined Standard Varnish as industrial sales manager.

Personnel Briefs of the Month

Chain Belt Co. of Milwaukee, manufacturers of Rex chain, conveyors, construction machinery and sanitation equipment, announces the election of John T. Brown, former works manager, as a vice-president of the company.

Eugene U. Maynard, for the past 23 years connected with the sales staff of General Chemical, at its Providence office, has resigned to become representative of Philipp Bros., with headquarters in Providence.

Robert W. Haywood has recently joined Industrial Chemical Sales to do development work with their well-known product "Nuchar."

Leland D. O'Connell, who has centered much of his active business career in the Southwest, has been appointed manager of Westinghouse's important Denver Colorado office.

John C. Bryan has taken a position with Foster D. Snell, Inc.

W. A. Appleton, formerly with Barrett, is now with the Potash Co. of America in a sales capacity with headquarters at Montgomery, Ala. The company's sales staff has been at the Carlsbad mines for training.

American Potash & Chemical adds Ernest Appleby to its potash sales staff as divisional manager of the new Chicago branch at 110 S. Dearborn st. He was formerly with Armour Fertilizer.

R. E. Wilkin, formerly manager of Standard of Indiana's technical department, is now assistant sales manager of organic products for Hooker Electrochemical.

Appointment of S. B. Bradshaw, as manager, and Dr. E. F. Pike, as technical director, is reported by the Armour Laboratories.

H. R. Hicks formerly with the Chicago office of the James S. Bent & Co., of Boston, has joined the staff of the Arthur C. Trask Co. of Chicago.

Albert Frankel has retired as general manager of the N. Y. office of the R. & H. Chemicals Division of du Pont. He was the guest of honor at a dinner Oct. 28th.

Fred L. Lavanburg Co., 105 Bedford ave., Brooklyn, has engaged Dr. Arthur E. Smith, well-known paint formulist, to help the paint trade in formulation problems.

McGowan Optimistic on Business Outlook

Gomberg and Foster Honored by A.I.C.—Jacobus Receives Morehead Medal—Kountze, Watson to Sell Fair Bonds—Zinsser on United Hospital Drive Committee—

Sir Harry McGowan, I. C. I. chairman arrived in this country last month, aboard the *Queen Mary*, with Lady McGowan, on his way to Australia. He will go by way of Canada, but expects to confer with the officials of du Pont, before he leaves for Canada. Sir Harry was optimistic about business conditions; said he believed world-wide recovery had set in and that, "barring war, economic improvement should continue."

Elected Honorary Members

Moses Gomberg has been elected to honorary membership in The American Institute of Chemists in recognition of his outstanding contributions as educator to the profession of chemistry.

Dr. Gomberg was born at Elizabetgrad, Russia. He obtained 3 degrees from the University of Michigan, studied at Munich and Heidelberg, and received an honorary Sc.D. degree from the University of Chicago. He has been awarded the Nichols medal ('14), the Willard Gibbs medal ('25), and the Chandler medal ('27). He was chairman of the department of chemistry at the University of Michigan until his recent retirement.

William Foster, a Fellow of The American Institute of Chemists since '29, was also elected to honorary membership in recognition of his outstanding contributions as educator to the profession of chemistry.

Born at Hartford, Ky., Dr. Foster was educated first at Hartford, then Vanderbilt, and Princeton. He has been a member of the faculty of Princeton University since 1900, attaining full professorship in 1910. He is the author of several textbooks on chemistry and of various papers in American, English, and German periodicals. He plans to retire from teaching next year.

Sommer Promoted

The Morehead Medal for the year '36 has been awarded to Dr. David Schenck Jacobus, head of the Babcock & Wilcox engineering dept., for his outstanding leadership in the formulation of codes and procedures which have made fusion welding acceptable. Medal was presented to Dr. Jacobus during the opening session of the 37th Annual Convention of the International Acetylene Association held at The Jefferson in St. Louis, Nov. 18th.

New home of General Dyestuff at 435 Hudson St., New York.

CHEMICAL

The Photographic Record

As they do it abroad. Exhibit of Nobel Chemical Finishes, Ltd., at the Builders Exhibition at the Olympia in London recently, which was devoted exclusively to Dulux. For a discussion on the value of these exhibits see Mr. Hart's article on page 583.

Leaders in electrochemistry met recently at seventieth annual convention of the Electrochemical Society held in Niagara Falls, Canada. Photograph shows, left to right, L. E. Saunders, Norton Co.; Hiram S. Lukens, U. of P.; F. C. Frary, Aluminum Co. of America; Colin G. Fink, Columbia University; James H. Critchett, Electro Metallurgical Corp.; R. L. Baldwin, National Carbon; Duncan A. MacInnes, Rockefeller Institute; R. R. Ridgway, Norton Co.; C. G. Schluederberg, K. A. Heilborn, Niagara Alkali; Paul J. Kruesi, Southern Ferro Alloys; F. J. Vosburgh, National Carbon.

—Courtesy of the Niagara Falls Gazette

The thirty-fifth anniversary of the National Oil and Supply Company, Newark, N. J., was celebrated with a beefsteak dinner and entertainment, and agents attended. Arthur Phillips, president of

NEWS REEL

of Our Chemical Activities

Russell-Hale Chemical Company, well-known Southern distributor of industrial chemicals, opens up a much larger office and warehousing facilities at Houston, Texas. Company has also acquired approximately an acre of ground for additional expansion.

Keystone Views

Count Covadonga, former heir to the Spanish throne, is seriously considering entering the chemical business. Caspar Smith, president, Smith Chemical and Color Co., Brooklyn, close friend of the Count, reports that the nature of the enterprise has not as yet been disclosed.

Billboard advertising, a new innovation with the Rolls Chemical Company of Buffalo, which has entered this field with the idea of promotional and institutional advertising concentrated in a given area at their end of New York State. Two of these painted highway signs already have been erected, and company further proposes erection of three additional signs on three main highways entering Buffalo.

on November 14, at Essex House, Newark. Representatives of the various companies for whose products National acts as distributors company, is seated at table in front of flower bouquet.

Medal is awarded annually by the International Acetylene Association to the person or persons who, in the judgment of its officers and Board of Directors,

DR. DAVID SCHENCK JACOBUS

"For advancing art of producing or utilizing carbide or its derivatives."

have done most to advance the industry or the art of producing or utilizing calcium carbide or its derivatives. Award was established in '22 by the Hon. John Motley Morehead, formerly U. S. Minister to Sweden; in honor of his father, the late James Turner Morehead who, in 1892, sponsored the experiment which led to the discovery of the electric furnace method of producing calcium carbide.

Now Bond Salesmen

DeLancey Kountze, chairman of the board of directors of Devoe & Raynolds, and a member of the N. Y. World's Fair bond sales committee, which is seeking to raise funds to finance the fair to be held there in '39 has been appointed chairman of the group for the paint and chemical industries. John J. Watson, of International Agricultural, is associated with Mr. Kountze and will direct the work in the chemical industry.

Andre Armengaud, prominent French engineer and patent counsel, who has been in the U. S. for several weeks returned early last month accompanied by Mme. Armengaud.

William H. Zinsser, president William Zinsser & Co., accepts chairmanship of the Chemicals & Paints Division in the United Hospital Campaign in N. Y. City.

B. J. Gogarty, Commercial Solvents, affectionately known in the trade as "Barney", is recovering from a serious operation at the N. Y. Hospital. He has been very active for years in affairs of the Salesmen's Association and the Drug and Chemical Section of the N. Y. Board of Trade.

H. C. Bercow, member of the firm of H. H. Rosethal & Co., is recovering from an illness which has kept him away from his office for several months. He expects to return before the first of the year.

Contract Season Opens: Prices Firm

Carlot Alkali Quotations Repeated—Spot Prices for Bichromates 1/8c Higher—Several Companies Eliminate Cash Discounts—Fewer Brackets in L. C. L. Price Structure—Patman Act Favorably Received — Calif. Alkali Export Association Formed—

November tonnages of industrial chemicals moving into consuming channels were very satisfactory. Withdrawals of products with higher prices announced for '37 were particularly heavy, indicating a keen desire by purchasing agents to go into the new year with large inventories.

With the announcement on Nov. 9th that the carlot quotations on alkali for '37 were unchanged from present levels the industrial chemical contract season opened up with a rush. One feature of the contracts offered by manufacturers of many important items is the elimination of the cash discount for early payment, the term of sale being net 30 days from the date of the invoice. The alkali and bichromate producers, however, have continued to offer cash discounts. Another feature of the contract season this year has been the elimination of numerous small brackets in the l.c.l. quotations. This action, of course, was brought about by the Robinson-Patman Act. In certain instances contracts are being written with the price review clause on a quarterly rather than a 6-months' basis.

Bichromate contract prices show very little change but the spot price is 1/8c higher. Schedules that reached the trade last month included bleaching powder, commercial aluminum sulfate, barium carbonate, sulfur chloride, strontium nitrate, caustic potash, sodium cyanide, anhydrous ammonia, barium chloride, and the alums. The carbon tetrachloride price schedule showed a slight revision in the quotations on small quantities and also a revision in the extinguisher grade. With a reduction of 1/2c in the spot prices for copper and zinc cyanides, the contract and spot quotations are now identical. While the quotation on chlorine in single unit tanks remains at $2.15, the prices for multiple units have been revised upwards.

The rise in metallic copper has forced blue vitriol producers to raise the basic carlot quotation to $4.15, and for the same reason the black copper oxide price was increased to 15¼c from 14¾c. A revision was announced in formaldehyde, the drum quotation being raised ¼c while the barrel figure is reduced ¼c to a 5¾c level. The highly competitive situation in prussiates was marked last month by a 2c reduction in yellow prussiate of potash and the current market is 16c. A sharp reduction of 2¼c was reported in sodium perborate. The extremely low price levels which have prevailed in Glaubers' Salt and anhydrous sodium sulfate were corrected somewhat when higher contract prices were announced. All of the tin salts were quoted higher following a sharp rise in the metal.

Important Price Changes

ADVANCED	Nov. 30	Oct. 31
Antimony	$0.12	$0.11¾
Copper oxide, black	.15¼	.14¾
Copper sulfate	4.15	4.00
Formaldehyde, drums	.05¼	.05
Glaubers' Salt	.95	.85
Glycerine, saponification	.22	.19
Soap lye	.20	.16¾
Lead acetate	.11	.10½
Potassium bichromate, spot	.08⅝	.08½
Sodium bichromate, spot	.06⅝	.06½
Sodium stannate	.34½	.34
Sodium sulfate, anhyd.	1.45	1.35
Tin crystals	.39	.35½
Oxide	.55	.49
Tetrachloride	.26½	.23¾
DECLINED		
Formaldehyde, bbls.	.05¾	.06
Hexamethylenetetramine	.35	.37
Potassium prussiate, yellow	.16	.18
Sodium perborate	.14¾	.17

So far the contract season has been an extremely orderly one. Consumers have shown a remarkable willingness to cooperate with the producers in any changes in contracts that have been made necessary to conform with the spirit as well as the definite requirements of the Patman Act. There has been less shifting of tonnages from one supplier to another than was expected.

Industries which are large users of industrial chemicals maintained a very active pace in November. While statistics of production in the various groups are not yet available, it seems quite certain that operations in nearly all lines increased rather than decreased in November from the October levels. Canadian newsprint set a new high record in October, but production in the U. S. is still far behind the records made in the 20's. For the first time in the history of the plate glass industry the output during October exceeded 20 million square feet. The previous monthly high was reached in September, '36, when production aggregated 19,554,000. Part of the spurt in October was, of course, directly attributable to preparations for a heavy demand from the automotive manufacturers for their '37 models.

Decline Expected in December

December tonnages are expected to show some decrease from the November figures but very little. There is little reason this year to cut inventories to the bone, while on the other hand, several reasons exist why companies will want to increase stocks of raw materials at the year-end.

Text of the new tin agreement has not been made public as yet, but details are now trickling in bit by bit in European dispatches. While no official confirmation of these details can be obtained, the European dispatches claim that they are based on reliable information, according to a statement appearing in the *N. Y. Journal of Commerce.*

According to these dispatches, the new agreement is supposed to run for 5 years, or until Jan. 1, '41. It will have 6 signatory countries, since Siam and Belgian Congo will be full-fledged members of the new agreement, in addition to the Netherlands, East Indies, Malaya, Bolivia and Nigeria.

Siam's basic quota is said to have been fixed at 18,500 tons and the one for Belgian Congo at 13,000 tons. However, the most important innovation in the agreement is supposed to be a clause which limits the possible restriction to a maximum of 60%. No such limits were fixed in the old agreement and the restriction, at one time, amounted to 66⅔%. Europe seems to feel that the new tin agreement represents an improvement over the old plan. It does not appear to be quite as rigid as the old scheme.

The International Tin Committee decided last month to advance the export quota for 3 of the signatory countries to 105% of standard, assigning to Bolivia a 90% quota. Countries assigned a 105% arrangement were Malaya, the Netherlands, East Indies and Nigeria, whose quotas are made up of 90% in their own right and 15% from Bolivia's original quota.

New Alkali Export Group

The California Alkali Export Association has filed papers with the Federal Trade Commission, under the Export Trade Act (Webb-Pomerene law) for exporting soda ash, sodium products and other derivatives of soda ash. The association will maintain an office at Los Angeles.

Officers of the association are: D. B. Scott, president; George E. White secretary; and J. R. Blair, treasurer. Members are: American Potash & Chemical; Pacific Alkali, Los Angeles; and West End Chemical, Oakland, Calif.

WPA a Buyer of Chemicals

Chemicals and explosives to the value of $2,953,232 have been purchased for use on various types of projects of the Federal Works Progress Administration, according to the latest available figures of the Division of Research, Statistics and Records of the WPA. Larger portion of this expenditure was for dynamite and blasting powder supplies.

The A. I. Ch. E. on Nov. 13th adopted a resolution advocating legislation setting up a Federal court of patent appeals.

Textile, Tanning Chemicals In Good Demand

Rayon Output Stays at Record Levels—Cotton Production Holds Up—'36 Shoe Production will Set Record—Killheffer Suggests $2,500,000 Textile Research Fund—

Purchasing of chemicals and specialties by both the textile and tanning industries showed some signs of slowing up in the final week of November, but the month's volume was not very far below that reached in October. The purchasing recession was caused largely by the Thanksgiving holiday period and strikes in a few of the rayon plants.

Important Price Changes

ADVANCED	Nov. 30	Oct. 31
Valonia beard	$48.00	$46.00
Zinc dust	.0705	.0685
DECLINED		
Albumen, egg	$0.77	$0.78
Myrobalans J1	22.00	24.00
J2	14.25	15.00
R2	14.00	14.50

Cotton spindles active in October totalled 23,638,270, as against 23,128,014 in the same period of last year and with 23,514,270 in September of this year. Cotton consumed in October totalled 646,499 bales of lint and 72,546 of linters, compared with 629,727 and 67,859 during September this year, and 552,840 and 67,279 during October last year. Hosiery shipments in September (latest available figures) show a total of 10,235,792 dozen pairs, as compared with 9,439,340 in August of this year and 9,318,024 dozen pairs in September of '35.

Wool consumption dropped somewhat in October from September figures. The October '36 weekly average consumed in the apparel class was 5,180,000 lbs., as compared with but 5,369,000 lbs. in September. Consumption increased somewhat in the carpet class consumption, the respective figures being 2,372,000 and 2,290,000. But, while consumption declined, "woolen spindle hours" and "worsted spindle hours" (as reported by the Bureau of the Census) increased somewhat in October.

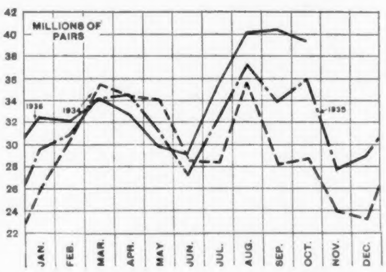
Demand for rayon continues at record levels. Commenting on existing conditions the *Rayon Organon* states: "With an active demand continuing into the forward months, a record-low stock position, a record-high production rate, and no new capacity in sight for nearly a year, it appears as though the present dilemma of the producers in allotting yarn on a percentage-of-requirements basis will continue for a number of months to come." In addition, strikes in rayon plants, now fortunately ended, increased the producers' troubles last month.

U. S. production of viscose plus cupra rayon in the 3rd quarter reached a new high level, amounting to 55,600,000 lbs., or a monthly average of nearly 19,000,000 lbs.

Silk takings in November of but 40,401 bales were about 5,000 bales below the trade expectations. It has developed, however, that some 5,390 bales were held up from delivery by the dock strike. There is little doubt, according to leading silk factors, that November was a better silk month than the plain figures would indicate. Demand was strong and increased during the second half of the month.

406,000,000 Pairs in '36

The '36 production of shoes will likely reach 406,000,000 pairs, an increase of almost 6% over the record-breaking '35 output. Production in the first 10 months exceeded '35 by 5.6%, and the October increase over October a year ago amounted to 9.5%. Sales have kept pace with production so that inventories have been pared. Last spring production was held down because of the large carryover in dealer's hands. November and December production is expected to show increases of about 6% over the corresponding figures for last year. Usually shoe output declines seasonally at this time of the year. Tanners are extremely optimistic over the outlook at least through the first quarter of '37.



After a slow start shoe production will top all previous years.

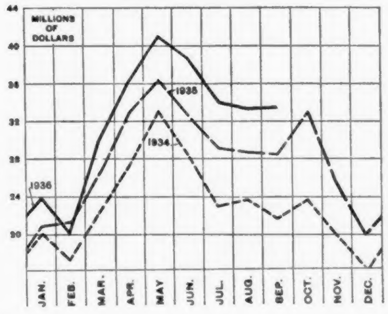
October shoe production totalled 39,361,898 pairs, as compared with 40,444,058 pairs in September of this year and 35,947,810 in October of last year. Production for the first 10 months reached 345,462,901 pairs, as compared with 327,098,120 pairs in the corresponding period of '35.

Establishment of a textile research fund of $2,500,000 a year, on the basis of one-tenth of 1% of annual sales of American companies in this industry, was urged by Elvin H. Killheffer, du Pont executive, before U. S. Institute for Textile Research at the Waldorf-Astoria, in N. Y. City last month. Fund would enable American industry to combat "stiffening competition from highly progressive foreign countries, notably Japan."

Lead Pigments Advanced Sharply; Lithopone Off 1/4¢

Further Price Increases Expected in Red Lead, Litharge—Carbon Black Carlot Prices Repeated—Paint Sales Continue to Show Increases Over '35—Outlook for Next Year Promising—Ester Gum 1/8c Higher—Naval Stores Have Spectacular Rises

Several important price changes featured the markets for raw paint materials last month. Red lead, litharge, and white lead, moved higher with the sharp rises in the metal. Lithopone, on the other hand, was reduced 1/4c, and zinc sulfide was reduced to 9c. Carbon black carlot prices have been renewed for '37 at unchanged levels, but some revision of the l.c.l. quotations is expected by the first of the year. The trade still awaits prices on colors. In the main it is expected that few changes will be made from existing levels, although it would not surprise the trade if chrome yellow was advanced slightly. The volume of raw materials moving into consuming channels was quite satisfactory, but paint manufacturers are largely in the in-between-season and little improvement is now anticipated for the next month or two.



Total paint sales for '36 to date, $290,540,344 as against $255,958,717 in same period in '35.

Important Price Changes

ADVANCED

	Nov. 30	Oct. 31
Litharge	$0.0678	$0.0630
Red lead, 95%	.0770	.0730
97%	.0795	.0755
98%	.0820	.0780
White lead	.06¾	.06½

DECLINED

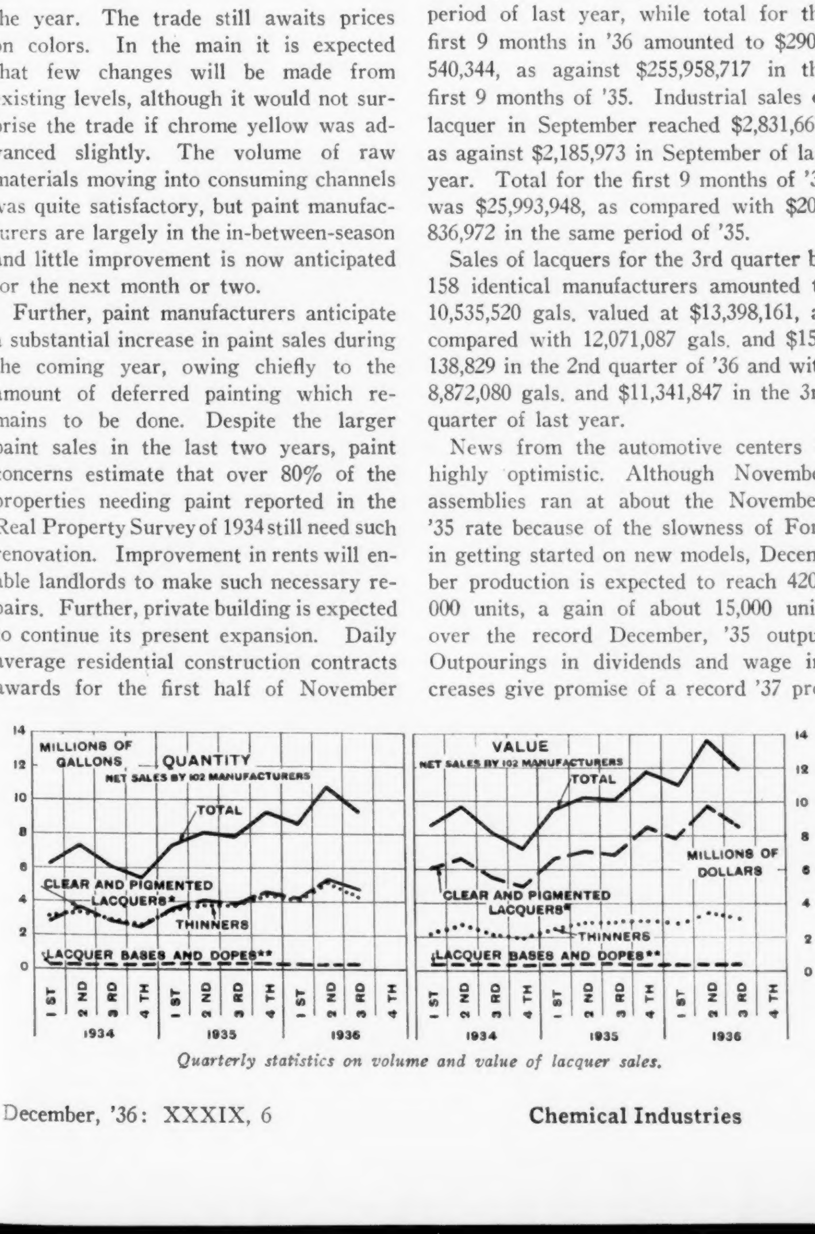
Lithopone, ord., bags	$0.04¼	$0.04½
High strength	.05¾	.06
Titanated	.05¾	.06
Zinc sulfide	.09	.09½

Further, paint manufacturers anticipate a substantial increase in paint sales during the coming year, owing chiefly to the amount of deferred painting which remains to be done. Despite the larger paint sales in the last two years, paint concerns estimate that over 80% of the properties needing paint reported in the Real Property Survey of 1934 still need such renovation. Improvement in rents will enable landlords to make such necessary repairs. Further, private building is expected to continue its present expansion. Daily average residential construction contracts awards for the first half of November ran well ahead of the October rate. While weather conditions undoubtedly will react unfavorably to further expansion in the first quarter of '37, paint producers are convinced that sales in the coming spring will equal '29 and perhaps even top that robust figure.

Paint sales by producers continue to show a sharp increase over comparative figures for '35. Total for 579 establishments in September reached $33,449,725, as compared with $28,536,075 in the same period of last year, while total for the first 9 months in '36 amounted to $290,540,344, as against $255,958,717 in the first 9 months of '35. Industrial sales of lacquer in September reached $2,831,667, as against $2,185,973 in September of last year. Total for the first 9 months of '36 was $25,993,948, as compared with $20,836,972 in the same period of '35.

Sales of lacquers for the 3rd quarter by 158 identical manufacturers amounted to 10,535,520 gals. valued at $13,398,161, as compared with 12,071,087 gals. and $15,138,829 in the 2nd quarter of '36 and with 8,872,080 gals. and $11,341,847 in the 3rd quarter of last year.

News from the automotive centers is highly optimistic. Although November assemblies ran at about the November, '35 rate because of the slowness of Ford in getting started on new models, December production is expected to reach 420,000 units, a gain of about 15,000 units over the record December, '35 output. Outpourings in dividends and wage increases give promise of a record '37 production. This, of course, augurs well for lacquer consumption.



Quarterly statistics on volume and value of lacquer sales.

Ester Gum 1/8c Higher

Ester gum was raised 1/8c last month because of higher costs for the raw material. Quotations are now 8¼c for 76,000 lbs. to be taken as wanted before the end of the year. The same price prevails for carlots. Smaller quantities run between 8½ and 8¾c. All prices are on a delivered basis.

Naval Stores Advance Sharply

The naval stores markets finally fulfilled earlier prophecies and both rosin and turpentine soared in November. While naval stores prices have been working gradually into higher levels since last summer, the rise last month bordered on the spectacular.

The common grades of rosin now hold at the highest level since 1929-1930, while rosins from G through X are higher than at any time since 1930-1931. Since the start of the current season, April 1st, prices have advanced 60 to 120%.

Buyers are finding stocks scarce, and some of the leading factors are said to have been suggesting to the government that it release some of its large supplies to prevent a speculative market and the possibility of a subsequent crash which would work considerable harm to the basic improvement of the industry.

Coal-Tar Chemicals

¶Benzol, Toluol, Xylol, and Solvent Naphtha Prices Renewed—Tar Acid Oil Higher—Cresylic Schedule Revised—

Coal-tar chemicals were again in exceptionally good demand last month. Benzol prices have been extended for the first half of '37 without change and carrying the usual quarterly adjustment clause. Prices are also unchanged on toluol, xylol, and solvent naphtha, but slightly higher for tar acid oil. The new schedule for cresylic is: low boiling, car lots, 77c; less car lots, 79c, f.o.b. works, freight equalized; high boiling, car lots, 72c; less car lots, 74c; special resin grade, car lots, 9c per lb.; less car lots, 9½c; high boiling, car lots, 72c per gal.; less car lots, 74c per gal.

Consumers at the close of the month were still awaiting '37 contract prices on phenol and the important intermediates. A very quiet market prevailed for naphthalene. Importers are hesitating over '37 contracts, awaiting domestic developments. According to the Tariff Commission, '36 production of crude will reach 70,000,000 lbs., as against 50,000,000 last year. A strong possibility exists that '37 production will amount to 100,000,000 lbs.

Seasonal Dullness Prevails in Raw Fertilizer Materials

Sulfate Now Quoted on Dec.-June Price Basis—Discounts on Potash End—Strobhar Tells Atlanta Convention Sales Outlook is Bright—Industry Being Investigated—

Seasonal dullness prevailed in the market last month for fertilizer raw materials. The discount on potash expired on Nov. 30th and sulfate of ammonia moved up 50c on the same date in accordance with the previously announced schedule for December-June deliveries. In the face of very light trading the organic ammoniates moved higher. Fish scrap quotations were advanced also. The fishing season in Chesapeake waters is about over for the year. Reports on the total tonnage differ, but estimates believed to be correct, place the volume between 15,000 and 17,000 tons.

Fertilizer sales in the South as indicated by the sale of tax tags were smaller in October than in September, contrary to the usual seasonal trend. They were also smaller than in October '35 but with that exception were the largest for any October since '28. In recent years October sales accounted for 3.3% of the total year's sales.

A substantial increase has been shown in the fiscal year to date, sales in the 12 Southern States of 388,849 tons in the July-October period exceeding the corresponding period of '35 by 26%.

January-October sales in the South were 8% larger than in the first 10 months of '35 and were larger than in any entire calendar year since '31. Oklahoma is the only state in this region to report smaller sales this year than last. The largest increase has been shown by Florida, with sales this year to date 65,000 tons larger than in the corresponding period of '35.

Aggregate October sales in the 5 Midwestern States were 29% larger than a year ago, with Illinois, Kentucky, and Kansas reporting increased sales. October sales in the past several years were responsible for 4.3% of the year's total. In the July-October period a 48% rise was recorded over last year.

According to reports from Washington, the Dept. of Justice, through its antitrust division, is making an under-cover investigation of an alleged unlawful combine in the fertilizer field. This is undoubtedly the aftermath of the operations of Representative Tarver (Dem., Ga.,) seeking such a probe.

The 12th annual Southern Convention, held at Atlanta Nov. 9-11th, was attended by 429 persons, slightly below the registration for the '35 meeting. Members were agreed that it was one of the best conventions ever held by the N.F.A. Said President Strobhar: "Indications are that the level of farm prices will at least not decrease and might increase, so that next year's demand for fertilizer will probably be higher than last season." He gave his approval to the general purpose of the Patman Act. Most of the time of the meeting was given over to discussion of two subjects, the Patman Act and the suggested trade practice rules.

Important Price Changes

ADVANCED	Nov. 30	Oct. 31
Ammonium sulfate	$26.00	$25.50
Blood, dried, N. Y.	3.90	3.75
Chicago	4.25	3.75
Imported	3.85	3.45
Bone meal, Chicago	18.50	18.00
Calcium phosphate, precip. dibasic	.70	.69
Fish scrap, unground	3.50	3.35
Hoof meal	2.85	2.75
Nitrogenous material:		
Imported	3.10	2.75
Eastern	3.00	2.85
Western	2.75	2.65
Tankage, ground	3.85	3.75
Chicago	3.75	3.50
Imported	3.90	3.75
DECLINED		
Bone, 4½ and 50, raw, Chicago	$22.00	$23.00

Fine Chemicals

¶Good Demand Reported for Fine Chemicals and Pharmaceuticals—Mercury Again Advanced—Platinum Higher—

Fine chemicals, pharmaceuticals, and photographic chemicals were in excellent demand throughout the past month. Price stability was the rule. However, a 3c reduction was reported in acetylsalicylic acid, the second reduction to be made in this item so far this year. Sodium perborate was also reduced sharply. Stocks of C.P. glycerine are very scarce and the trade anticipates the possibility of still further advances. Sales of citric and tartaric acids have been holding up well for this period of the year and prices are firm at published levels. Competition in vanillin became rather acute last month and producers finally made a 10c reduction.

Consumers of platinum are wondering just what will happen in the near future. After a flier from $40 to $70 the market collapsed back to the $40 level. During the past month the market again gave signs of rising and most sales were reported at approximately $45 an oz.

Important Price Changes

ADVANCED	Nov. 30	Oct. 31
Mercury	$93.00	$92.00
DECLINED		
Acelylsalicylic acid	$0.55	$0.58
Vanilin, ex eugenol	3.65	3.75
Ex guaiacol	3.55	3.65

Solvents

¶Acetone Reduced 1c—Alcohol Makers Raise Quotations—Solvent Consumption Increasing—

Acetone was once again reduced, the decline in November amounting to 1c. Competition in this item has been severe now for several months. Prices for dibutyl phthalate for '37 are based on 18½c in tanks and 19½c in drums in carloads. Diethyl phthalate is quoted at 17c in tanks and 18c in drums. Markets for petroleum solvents were steady in the past 30 days. Quotations on the Pacific Coast were firm, following the reductions reported in last month's issue. Prices for '37 have not as yet been announced, but the consensus of opinion is that very few changes will be made.

Consumption of solvents increased in November over October, largely because of the improvement in the automotive and tire industries. Rubber consumption in October continued at a rapid pace and totalled 49,509 tons, an increase of 6.9% over September and 18% over October a year ago. With increased demand for original tire equipment from the Detroit automobile area in November, it is reasonable to suppose that November rubber consumption figures will show further improvement over October's satisfactory volume. For the first 10 months rubber consumption has totalled 473,593 tons of crude, as against 406,760 tons during the corresponding period last year, an increase of about 16%. Consumption in '36 will very likely establish a new all-time record.

Producers of special solvent alcohol announced 3c advance in prices, effective at once, and covering business to the end of the first quarter in '37. New quotations are:—Tanks, 27c; drums, car lots, 33c; 20 drums, 35c; 1 to 19 drums, 38c. Quotations on completely denatured alcohol were also advanced to the following position:—Drums, car lots, 33c; 20 drums, 35c; 1 to 19 drums, 38c. No change was made in the schedule on specially denatured alcohol, formula No. 1. Above prices prevailed at the works east of the Rockies.

Important Price Changes

ADVANCED	Nov. 30	Oct. 31
Alcohol:		
Spec. solvent, tks.	$0.27	$0.24
Formulas 11, 12, 13 drs.	.33	.30
DECLINED		
Acetone, tks.	$0.06	$0.07
Drs.	.07	.08
Alcohol, pure, drs.	4.11	4.13
Bbls.	4.12	4.14

Oils and Fats

¶Copra Price Rise Features Oils and Fats Markets—

Outstanding occurrence in the oils and fats last month was the further sharp rise in copra in the London market. Offerings of Philippine material cannot be had. Factors there are unwilling to make definite commitments in the face of such a rapidly rising international market and the lack of assurance that deliveries can be made because of the shipping conditions on the Pacific Coast. The sharp rise in the last 60 days in copra has forced up coconut. On July 1st it was quoted at 4c in tanks in N. Y. City. Today offerings are nominal at 7¼c and producers are not willing to make deliveries before February. The only material available at the moment is from a few resellers. The sensational spurt in coconut oil has been reflected in rising prices for other oils, notably palm.

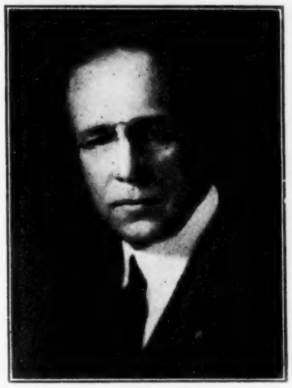
Chinawood's gradual decline extending over the past few months continued in November and tanks were quoted at about 12½c. Soybean oil, most of the fish oils, whale oil, practically all of the animal fats, degras, and the greases were quoted last month at higher levels. Linseed was slightly lower in the 30-day period. Both lard and cottonseed oil prices have advanced rapidly during the past few weeks but lard has been outrunning cottonseed oil considerably on the way up.

One reason for the present firm price structure is the attitude of the packers toward lard. Since higher fat-oil prices next year are confidently expected and predicted, heavy inventory buying would be natural. However, the packers are said to prefer storing lard to selling freely, so that a rather tight situation exists.

Obituaries

Dr. Theodore Brentano Wagner, 67, chemical engineer and consultant, died, Nov. 12th, after an illness of several months.

Dr. Wagner was born in Chicago, the son of William Wagner, a physician. He was a nephew of Theodore Brentano, former U. S. Minister to Hungary. His early youth was spent in Paris and Dresden and in 1882 he entered Wuerzburg University in Germany where he received a doctorate in philosophy. He did post-graduate work at the University of Basle and, also studied under Emil Fischer. Dr. Wagner returned to Chicago in 1893 and in 1896 became associated with the Godchaux sugar interests. He served with the U. S. Board of Appraisers in 1899 and later in that year became associated with the Glucose Sugar Refining Co. Three years later Dr. Wagner joined the staff of Corn Products Refining and was general superintendent until 1906 when he was made a member of that company's executive board, where he remained until 1919. While with that



DR. THEDORE B. WAGNER

organization, Dr. Wagner was responsible for the development of several chemical processes for the manufacture of corn syrup. During the World War he was a member of the Food Control Board and also served as a member of the Shipping Board. From 1919 to 1922 he was vice-president of the United States Food Products Corporation. He had been engaged in private practice as a chemical engineer and consultant since 1922. Dr. Wagner held distinguished office in several scientific societies. He was a member of the consulting board of editors of CHEMICAL INDUSTRIES.

Robins Dies Suddenly

George Stanley Robins, prominent industrial chemical distributor in St. Louis, died suddenly on Nov. 21st from a cerebral hemorrhage. He was in perfect health and his sudden death at the age of 44 was a distinct shock to wide circle of friends and business acquaintances.

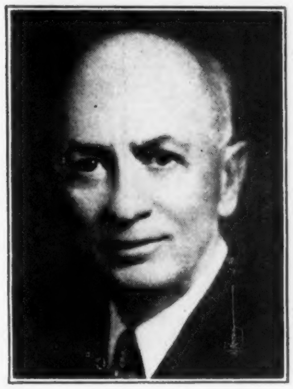
GEORGE STANLEY ROBINS

Mr. Robins was born in Brooklyn and graduated from Rutgers in '13. He went to St. Louis shortly after leaving college, and in '17 helped organize the chemical firm, which he thereafter headed. The rise of his firm was spectacular. He was very active in civic affairs in St. Louis.

Surviving are his wife, Mrs. Bessie A. Robins, and 2 sons, George Kenneth, 20 years old, and Seth A., 18. Both are students of Colgate, Hamilton, N. Y.

Leader in the Coatings Field

William Samuel Rowland 55, president, Stanley Chemical, East Berlin, Conn. died suddenly Nov. 12th while visiting friends in Great Barrington, Mass. He attended Cornell, graduating with the Class of 1907 with an A.B.. Mr. Rowland entered the employ of Arthur D.



WILLIAM SAMUEL ROWLAND

Little, Inc. and upon concluding an assignment with the Stanley Works of New Britain, Conn., entered its employ as a chemical engineer.

During his engagement by the Stanley Works, Mr. Rowland was instrumental in the development of many valuable processes relating to japan, lacquer and synthetic coatings which ultimately led to the establishment of a subsidiary manufacturing organization under his leadership.

Other Deaths of the Month

Robert J. Munn, 65, general superintendent of Lilly Varnish, died in Louisville on Nov. 17th. Mr. Munn had been attending the national convention of the Association of Paint and Varnish Clubs in Chicago and died suddenly in a Pullman car in the Louisville station.

Mrs. Lee H. Bauer, wife of Frank M. Bauer, member of the firm of Pfaltz & Bauer, chemical importer, N. Y. City, died of a heart ailment Nov. 9th. Mr. and Mrs. Bauer had been married 30 years.

Mercer B. Mayfield, Jr., 43, a chemist with General Chemical, died Nov. 29th, at his home, 19 Amackassin Terrace, Yonkers, N. Y., after an illness of several months.

George P. Huisking, 50, brother of Charles L. Huisking, president of Chas. L. Huisking & Co., and Chicago manager of the firm, died of a fractured skull and pneumonia Nov. 22nd in Chicago, Ill. He was injured in a fall.

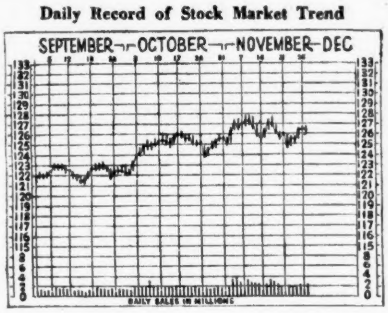
Alden B. Swift, 51, a vice-president and director of Swift, died in Chicago on Oct. 13th.

Stocks Rise In Post-Election Boom

1,127 Companies Declare $883,202,302 in Dividends—Trading Heaviest Since February — Chemical Group Shares in General Market Advance — Earnings Statements Reflect Improvement in Chemical Consumption—

In a post-election boom prices on the N. Y. Stock Exchange gained $1,512,320,670 last month. The rise was attributed directly to the declarations of dividends in unprecedented numbers, the total of $883,202,302 by 1,127 corporations constituting a new all-time record. Not one reduction was reported in the 30 day period. The previous high was in December, 1930, when $567,877,243 was disbursed. Many of the special dividends, of course, were declared as a direct result of the new corporation tax laws.

Daily Record of Stock Market Trend



—N. Y. Herald-Tribune

Trend of stocks was irregular in November, but substantial net gains were registered.

Trading was particularly heavy last month. The turnover, with only 22 sessions, was the heaviest of any month since last February and the largest for a November since '29, with the exception of last year. Sales totalled 50,469,732 shares, as compared with 43,998,322 for October and 57,462,895 in November of '35. Dealings in bonds at $290,875,900 showed a drop of $12,060,400 from a year ago.

The chemical group shared in the general market advance. Value of all chemical stocks on the N. Y. Stock Exchange on Dec. 1st totalled $6,650,614,575, as compared with $6,406,150,555 on Nov. 1st, a net gain of $244,464,020. This in turn compares with net gain of $346,236,467 in October. The average price on Dec. 1st stood at $81.42, as compared with $78.43 on Nov. 1st, a net gain of $2.99. In the month of October the average price gained $4.23. Practically all of the leading common issues registered gains in November. Outstanding gains were: 4¼ points in Air Reduction, 5 points in Allied, 7¼ points in du Pont, 5½ points in Mathieson, and 5¼ points in Monsanto. Losses of 2 points were recorded in Columbian Carbon, and 2¾ points in Standard of N. J.

Earnings Statements

American Cyanamid and subsidiaries report for the first 9 months of this year a net income of $2,803,266 after depreciation, depletion, research and process development expense, interest, Federal income taxes, minority interest and other charges. This equalled $1.11 each on 2,520,368 shares of $10-par combined Class A and Class B common stock outstanding, excluding shares held by subsidiaries. No mention was made of provision for Federal surtax on undistributed earnings.

In the corresponding time last year the net income was $2,533,969, or $1 a share on combined common shares.

A.A.C.'s 3rd Quarter Net, $23,158

Report of American Agricultural Chemical Co. of Delaware and subsidiaries for period July 1 to Oct. 1, '36, shows net profit of $23,158 after ordinary taxes, depreciation, depletion, reserve for self-insurance, etc., equal to 11c a share on 210,934 no-par shares of capital stock. Report states that no deduction is necessary at this time for normal federal income taxes or surtax on undistributed profits. This compares with net loss of $109,600 for the period from July 1, 1935, to Oct. 3, 1935.

Westvaco Earns $128,236

Report of Westvaco Chlorine and subsidiaries for quarter ended Sept 30th, shows net profit of $128,236 after depreciation and federal income taxes, equal after allowing for quarterly dividend requirements on the 21,946 shares (par $100) old 7% preferred stock which was outstanding on that date to 31c a share on 284,962 no-par shares of common. No provision was made for surtax on undistributed profits.

This compares with $148,071 or 38c a common share in preceding quarter, and $143,509 or 37c a share in September quarter of '35.

Earnings for the 3rd quarter of '36

Dividends and Dates

Name	*Div.*	*Stock Record*	*Payable*
Archer-Daniels-Midland	50c	Nov. 20	Dec. 1
Archer-Daniels-Midland, sp.	$1.00	Nov. 20	Dec. 1
Atlas Powder, ext.	25c	Nov. 30	Dec. 10
Atlas Powder	50c	Nov. 30	Dec. 10
Carman & Co., Cl. A, acc.	50c	Nov. 14	Dec. 1
Catalin Corp., sp.	40c	Nov. 15	Dec. 15
Celluloid, 1st pt. pf.	$2.00	Dec. 5	Dec. 19
Certain-Teed Prod., pf.	$1.75	Nov. 20	Dec. 1
Certain-Teed Prod., 6% pr. pf.	$1.50	Dec. 18	Jan. 1
Clorox Chemical	75c	Dec. 15	Dec. 30
Colgate-Palmolive-Peet	12½c	Nov. 6	Dec. 1
Colgate-Palmolive-Peet, ext.	25c	Dec. 5	Dec. 24
Colgate-Palmolive-Peet, pf.	$1.50	Dec. 5	Jan. 1
Columbian Carbon	$1.00	Nov. 20	Dec. 10
Columbian Carbon, sp.	$1.25	Nov. 20	Dec. 10
Commercial Solvents, sp.	20c	Nov. 21	Dec. 15
Commercial Solvents	30c	Nov. 21	Dec. 15
Continental-Diamond Fibre	50c	Dec. 7	Dec. 21
Cook Paint	15c	Nov. 21	Dec. 1
Cook Paint, $4 pf.	$1.00	Nov. 21	Dec. 1
duPont	$2.00	Nov. 25	Dec. 15
duPont, deb.	$1.50	Jan. 8	Jan. 25
Franklin Rayon	$1.20	Dec. 15	Dec. 21
Freeport Texas	25c	Nov. 18	Dec. 1
Freeport Texas, pf.	$1.50	Jan. 15	Feb. 1
Hercules Powder	$2.00	Dec. 10	Dec. 21
Heyden Chemical, ext.	75c	Nov. 28	Dec. 1
Heyden Chemical	50c	Nov. 20	Dec. 15
Int'l Salt, ext.	12½c	Dec. 1	Dec. 15
Int'l Salt	37½c	Dec. 1	Dec. 15
Lincoln Printing Ink	50c	Dec. 10	Dec. 21
Lindsay Light & Chem., pf.	17½c	Dec. 5	Dec. 21
Mathieson Alkali	37½c	Dec. 5	Dec. 23
Mathieson Alk., pf.	$1.75	Dec. 5	Dec. 23
Merck, ext.	20c	Dec. 4	Dec. 15
Merck	20c	Dec. 4	Dec. 15
Merck, pf.	$1.50	Dec. 22	Jan. 2
Monsanto	25c	Nov. 25	Dec. 15
Monsanto, sp.	$1.25	Nov. 25	Dec. 15
Nat''l Lead, pf. A	$1.75	Nov. 27	Dec. 15
Nat'l Lead, ext.	37½c	Dec. 4	Dec. 21
Nat'l Lead, Cl. B	$1.50	Jan. 18	Feb. 1
Nat'l Oil Prods., ext.	$2.00	Dec. 10	Dec. 18
Newport Industries	60c	Dec. 10	Dec. 15
Patterson Sargent, ext.	25c	Nov. 25	Dec. 1
Patterson Sargent	25c	Nov. 25	Dec. 1
Penick & Ford	75c	Dec. 1	Dec. 15
Pa. Salt Mfg., ext.	$2.25	Nov. 30	Dec. 15
Pa. Salt Mfg.	$1.00	Nov. 30	Dec. 15
Pittsburgh Plate Glass	$2.00	Dec. 5	Dec. 21
Pratt & Lambert	50c	Dec. 4	Dec. 21
P. & G., 5% pfd.	$1.25	Nov. 25	Dec. 15
St. Joseph Lead, sp.	25c	Dec. 10	Dec. 21
St. Joseph Lead	25c	Dec. 10	Dec. 21
Sherwin-Williams, pf.	$1.25	Nov. 14	Dec. 1
Spencer Kellogg	40c	Dec. 15	Dec. 31
Swan-Finch, pf. acc.	$1.31¼	Dec. 1	Dec. 15
Texas Gulf Sulphur, ext.	50c	Dec. 1	Dec. 15
Texas Gulf Sulphur	50c	Dec. 1	Dec. 15
Tubize-Chatillion, 7% pf. acc.	$5.25	Nov. 10	Dec. 1
Tubize-Chatillion, 7% pf.	$1.75	Dec. 10	Jan. 2
Union Carbide	80c	Dec. 4	Jan. 1
United Carbon, ext.	75c	Dec. 4	Dec. 19
United Carbon	75c	Dec. 4	Dec. 19
United Dyewood, pf.	$1.75	Dec. 11	Jan. 1
United Dyewood	25c	Dec. 11	Jan. 2
Westvaco Chlorine	25c	Nov. 10	Dec. 1

As of November 27th

Price Trend of Chemical Company Stocks

	Oct. 31	Nov. 6	Nov. 13	Nov. 20	Nov. 27	Nov. 30	Net gain or loss last month	Price on Nov. 30, 1935	1936 High	1936 Low
Air Reduction	77¾	84	83	83	82	82	+ 4¼	170½*	86½†	58
Allied Chemical	233	237	239	231	233	238	+ 5	164⅞	245	157
Columbian Carbon	122	128	122	117	...	120	— 2	96⅝	136½	94
Com. Solvents	16⅛	17	17⅛	17	16⅝	16½	+ ⅜	21⅝	24⅝	14¼
du Pont	174	178⅛	179½	184	182	181¼	+ 7¼	144½	184¾†	133
Hercules Powder	130	...	...	...	135	...	......	87¼	138†	84
Mathieson	36	37	37	41	42	41½	+ 5½	32¼	42⅜†	27½
Monsanto	94¼	95½	98½	100⅜	99½	99½	+ 5¼	93½	103	79
Std. of N. J.	68½	67	65½	65	66¼	65⅞	— 2¾	...	70⅛†	55⅛
Texas Gulf S.	39	40⅜	44	42	42⅞	41⅛	+ 2⅛	31¼	44¾†	33
Union Carbide	100½	101	101¾	103⅞	103¾	103¼	+ 2¾	73½	105¼†	71⅝
U. S. I.	39	40¾	40	42	40¾	40	+ 1	47	59	31¼

* Old stock; † New high.

were adversely affected by the construction program which was completed during this period and the resultant interference with current operations.

Freeport Reports 60c in Quarter

Freeport Texas reports 3rd quarter earnings of 60c a share on the common after provision for dividends on the preferred. Net earnings were $495,637.79, as against $334,321.21, or 40c a common share for the 3rd quarter of '35. Earnings for the first 9 months were $1,510,510.54 or $1.82 per share of common, as against $889,641.05 or $1.05 a share for the same period a year ago. Texas Gulf Sulphur also reported improved earnings in the 3rd quarter, See C. I., November, p538.

United Carbon—$1,574,964

Report of United Carbon and subsidiaries for 9 months ended Sept. 30th, shows net profit of $1,574,964 after federal income taxes, depreciation, depletion and other charges, equivalent to $3.96 a share on 397,885 no-par shares of common. No provision was made for federal surtax on undistributed profits. This compares with $1,363,721 or $3.43 a share in first 9 months of '35.

For quarter ended Sept. 30th, net profit was $487,358 after above deductions, equal to $1.23 a share comparing with $519,776 or $1.31 a share in preceding quarter and $425,125 or $1.07 a share September quarter of previous year.

Special Christmas Melons

Chemical companies joined the long procession of companies declaring special Christmas melons for stockholders. In addition to those announced in the last issue, the following "specials" were declared in November:—

Abbott Laboratories	50c
American Cyanamid	40c
Archer-Daniels-Midland	$1.00
Atlantic Refining	25c
Colgate-Palmolive-Peet	25c
Commercial Solvents	20c
Cook Paint & Varnish	40c
Corn Products	45c
International Printing Ink	$1.00
International Salt	12½c
National Lead	37½c
National Oil Products	$2.00
Standard of Indiana	$1.00
Standard of N. J.	75c
Texas Gulf Sulphur	50c

Additional Dividend Reports

Penn. Salt Manufacturing Co. has declared an extra dividend of $2.25 a share and a quarterly dividend of $1 on the common stock, both payable on Dec. 15th. Above payments will bring total dividend for the year to $8.50 a share, compared with $4 paid in the preceding year. It was announced that hereafter the board of directors will consider quarterly dividends for payment on Mar. 15th, June 15th, Sept. 15th and Dec. 15th.

A. A. C. has declared a dividend of $1.75, bringing total payments for the year to $4 a share. The last was 75c, paid on Sept. 30th.

Celluloid Corporation has declared an accumulation dividend of $2 a share on the 1st preferred participating stock, payable on Dec. 19th. On Oct. 16th when a like amount was paid, the arrears totalled $36 a share.

A dividend of $1.75 on the preferred stock of Sherwin-Williams Co. of Canada has been declared against arrearages.

Plans Corporate Changes

Freeport Texas Co., (sulfur) plans to effect changes in the company's corporate structure which involve the dissolution of certain subsidiaries, and if the changes are approved by the board of directors and stockholders, the company's name may be changed to Freeport Sulphur Co. Also under consideration and subject to the approval of the board is a plan to reduce the authorized convertible preferred stock by 12,699 shares. Authorized preferred stock consists of 25,000 shares which are convertible into common stock of the company, and as 12,699 of these shares have been converted into common, company plans to reduce its capital stock by that much.

Corning Acquires Macbeth-Evans

Corning Glass Works, world's largest maker of technical glassware, has acquired the famous Macbeth-Evans Glass

CORNING'S AMORY HOUGHTON

Company is under the guidance of the 4th generation.

of Pittsburgh. Negotiations leading to the purchase have been completed and the action has been ratified by the Boards of Directors of the two companies. Ratification by stockholders should be completed in time to permit operations on the new basis on Jan. 1, '37. The two plants of Macbeth-Evans Glass, located at Charleroi, Pa., and Elwood, Ind., will be operated as divisions of Corning Glass.

Earnings Statements Summarized

Company:	Annual dividends	Net income 1936	Net income 1935	Common share earnings 1936	Common share earnings 1935	Surplus after dividends 1936	Surplus after dividends 1935
American Commercial Alcohol:							
g Nine months, Sept. 30	*f*....	$924,813	$449,813	$3.54	$1.72	......	......
American Cyanamid:							
September 30 quarter	*w*.15	1,095,263	1,040,289	.43	.41	......	......
Nine months, Sept. 30	*w*.15	2,803,266	2,533,969	1.11	1.00	......	......
California Ink:							
Year, Sept. 30	§2.00	392,470	308,487	4.06	3.19	......	......
Celluloid:							
Six months, June 30	*f*....	70,004	......	....	....	......	......
Certain-teed Products:							
Sept. 30 quarter	*f*....	131,208	201,066	....	....	......	......
Nine months, Sept. 30	*f*....	†74,547	364,714	....	....	......	......
Continental Diamond Fibre Co.:							
Sept. 30 quarter	*w*.50	168,999	45,009	.37	.10	......	......
Nine months, Sept. 30	*w*.50	398,971	91,808	.87	.20	......	......
Fansteel Metallurgical:							
Sept. 30 quarter	*f*....	39,013	*......	.15	....	......	......
Nine months, Sept. 30	*f*....	117,733	*......	.45	....	......	......
Formica Insulation:							
Nine months, Sept. 30	*w*.20	153,329	96,225	.85	.53	......	......
International Nickel Co. of Can., Ltd.:							
Sept. 30 quarter	*w*.40	9,572,106	7,742,585	.62	.50	$3,986,272	$4,343,476
Nine months, Sept. 30	*w*.40	27,029,080	18,080,827	1.75	1.14	12,458,304	9,341,319
New Jersey Zinc:							
Sept. 30 quarter	§2.00	1,253,813	1,168,003	.64	.59	272,181	186,371
Nine months, Sept. 30	§2.00	3,593,585	3,342,216	1.83	1.80	*d*332,943	397,320
Newport Industries:							
Sept. 30 quarter	*f*....	147,357	48,588	....	....	......	......
Nine months, Sept. 30	*f*....	309,761	200,860	....	....	......	......
Twelve months, Sept. 30	*f*....	404,019	*......	....	....	......	......
Sherwin-Williams:							
Year, August 31	4.00	5,887,629	4,814,704	8.04	6.18	......	......
Skelly Oil Co.:							
Sept. 30 quarter	*f*....	1,307,595	796,944	1.20	.69	......	......
Nine months, Sept. 30	*f*....	3,511,431	......	3.19	....	......	......
Twelve months, Sept. 30	*f*....	4,563,235	......	4.14	....	......	......
Staley (A. E.) Mfg. Co.:							
Twelve months, Sept. 30	*w*2.00	1,537,962	*......	....	....	......	......
Standard Oil Co. of Calif.:							
Sept. 30 quarter	§1.00	7,685,528	5,175,859	.59	.39	......	......
Nine months, Sept. 30	§1.00	16,665,074	15,759,001	1.28	1.20	......	......
United Carbon:							
Sept. 30 quarter	3.00	487,358	425,752	1.23	1.07	*......	*......
Nine months, Sept. 30	3.00	1,574,964	1,363,721	3.96	3.43	*......	*......
United Chemicals, Inc.:							
Sept. 30 quarter	*f*....	†15,304	†11,024	....	....	......	......
Nine months, Sept. 30	*f*....	†26,971	†38,151	....	....	......	......
Vulcan Detinning:							
Sept. 30 quarter	*w*4.00	77,679	77,719	1.58	1.56	......	......
Nine months, Sept. 30	*w*4.00	205,170	217,971	3.89	4.21	......	......

f No common dividend; *w* Last dividend declared; § Plus extras; † Net loss; * Not available.

Chemical Stocks and Bonds

1936 November Last	1936 November High	1936 November Low	1935 High	1935 Low	1934 High	1934 Low	Sales Number of shares Nov. 1936	Sales 1936	Stocks	Par $	Shares Listed	Dividends*	Earnings $-per share-$ 1935	Earnings $-per share-$ 1934
NEW YORK STOCK EXCHANGE														
82	86½	58	57½	35	37⅝	30⅝	22,400	289,700	Air Reduction	No	2,523,864	$2.50	2.10	1.66
238	245	157	173	125	160¾	115⅛	11,800	404,200	Allied Chem. & Dye	No	2,214,099	6.00	8.71	6.83
88⅛	89	49	57¾	41½	48	25¼	9,500	120,300	Amer. Agric. Chem.	100	315,701	2.25	*p*4.71	*p*6.37
32¾	35⅜	20½	35¾	22½	62½	20¾	91,000	411,000	Amer. Com. Alcohol	20	260,716	.50	3.16	3.57
40½	50	37	52	36	39⅛	26¼	9,700	78,700	Archer-Dan-Midland	No	549,546	3.00	*p*3.05	*p*4.21
78½	84	48	48½	32¾	55½	35¼	5,600	59,700	Atlas Powder Co.	No	234,235	3.00	2.81	2.49
129	129	112	115	106¾	106¾	83	820	6,110	5% conv. cum. pfd.	100	88,781	5.00	16.93	13.54
27⅛	32¼	21¾	35⅜	19½	44⅞	17⅛	143,500	1,023,600	Celanese Corp. Amer.	No	987,800	.50	1.99	1.25
18	20½	13	21	15⅛	18⅛	9⅜	110,700	780,600	Colgate-Palm.-Peet	No	1,985,812	.75	1.36	1.16
104½	106½	100	107¼	101	102½	68½	300	29,400	6% pfd.	100	254,500	6.00	16.79	16.14
120	136½	94	101¼	67	77¼	58	7,100	113,500	Columbian Carbon	No	538,154	5.25	5.56	3.93
16½	24⅝	14¼	23⅞	16½	36¾	15¾	163,400	1,988,500	Commer. Solvents	No	2,635,371	.80	1.02	.89
71½	82½	63⅝	78⅜	60	84½	55½	37,900	449,300	Corn Products	25	2,530,000	3.75	2.62	3.16
163	168½	158	165	148¼	150½	135	2,280	11,380	7% cum. pfd.	100	243,739	7.00	33.97	39.65
60½	60½	42	50⅜	35½	55¼	29	5,400	50,700	Devoe & Rayn. A	No	95,000	2.00	2.89	2.36
181¼	184¾	133	146½	86⅝	103⅞	80	39,200	473,100	DuPont de Nemours	20	10,871,997	6.10	5.04	3.63
132⅜	133⅛	129	132	126⅞	128½	115	4,000	37,500	6% cum. deb.	100	1,092,699	6.00	56.94	42.73
180	185	156	172¼	110½	116½	79	10,200	113,700	Eastman Kodak	No	2,250,921	6.75	6.90	6.28
162	166	152	164	141	147	120	210	3,730	6% cum. pfd.	100	61,657	6.00	258.09	235.22
28¼	35⅝	23½	30⅝	17¼	50⅜	21½	72,200	385,700	Freeport Texas	10	784,664	1.00	1.78	1.76
110	135	108	125	112½	160⅛	113½	220	1,730	6% conv. pfd.	100	25,000	6.00	121.30	120.08
41⅞	55¼	39¾	49½	23⅜	28⅜	15⅝	27,200	346,000	Glidden Co.	No	603,304	2.00	.....	*x* 2.91
54	55	52¼					42,000	72,800	4½% cum. pfd.	50	200,000	2.25	.....	.....
105	133	102	119½	85	96⅞	74	7,200	26,200	Hazel Atlas	25	434,409	7.64	7.58	5.21
135	138	84	90	71	81⅝	59	1,700	46,100	Hercules Powder	No	582,679	5.44	4.23	3.94
129½	135	126	131	122	125¾	111	400	3,970	7% cum. pfd.	100	105,765	6.00	36.30	28.79
39⅛	41⅜	25⅜	36⅜	23½	32	19⅜	35,200	472,300	Industrial Rayon	No	600,000	1.68	1.00	2.23
4⅞	5⅞	2⅞	5	2⅝	6⅛	2	11,700	328,600	Intern. Agricul.	No	436,049	None	*p*1.55	*p*—.99
41¼	41	22¾	42¾	26	37¼	15	10,300	78,800	7% cum. pr. pfd.	100	100,000	None	*p*2.23	*p*2.69
63	66⅜	43¼	47¼	22¼	29¼	21	276,700	2,280,700	Intern. Nickel	No	14,584,025	1.40	1.65	1.14
29	30	23	36¼	25	32	21	2,700	37,100	Intern. Salt	No	240,000	1.62½	1.32	2.02
33½	36¾	29¾	36¼	31	33⅛	15¾	6,300	32,000	Kellogg (Spencer)	No	500,000	1.60	.....	*v*2.22
79¼	80¼	47¼	49¼	21½	43⅞	22½	60,600	668,500	Libbey Owens Ford	No	2,559,042	3.50	3.26	1.25
44	44¾	32½	37¼	24½	35⅜	16⅛	24,700	201,700	Liquid Carbonic	No	342,406	1.60	*v*3.06	1.96
41½	42⅜	27½	33⅞	23¾	40¾	23½	32,700	324,200	Mathieson Alkali	No	650,436	1.50	1.44	1.20
99½	103	79	94¾	55	61⅝	39	13,000	161,800	Monsanto Chem.	10	864,000	3.00	3.84	3.03
36½	36½	26⅜	20⅝	14½	17	13½	92,500	303,400	National Lead	10	3,098,310	.875	1.08	.84
158	168	155	162½	150	146½	122	500	3,100	7% cum. "A" pfd.	100	243,676	7.00	25.40	20.12
142	144	137¾	140½	121⅝	121½	100½	30	3,480	6% cum. "B" pfd.	100	103,277	6.00	49.05	35.36
27¾	28⅞	9	10⅞	4⅜	13	5½	231,000	1,224,000	Newport Industries	1	519,347	.60	.57	.31
161	164	128	129	80	94	60	10,300	134,600	Owens-Illinois Glass	25	1,200,000	6.00	6.52	5.41
52¾	54½	40¼	53¾	42⅜	44⅜	33⅛	30,100	296,600	Procter & Gamble	No	6,410,000	1.87	*p*2.39	*p*2.23
116½	122½	116½	121	115	117	102½	490	4,340	5% pfd. (ser. 2-1-29)	100	171,569	5.00	*p*94.14	*p*88.13
9⅞	10⅜	5⅝	8¾	4	6¾	3⅛	155,500	611,900	Tenn. Corp.	5	857,896	None	.22	.27
41⅛	44¾	33	36¾	28¾	43¼	30	105,200	490,800	Texas Gulf Sulphur	No	2,540,000	2.50	1.94	1.81
103¼	105¼	71⅝	75¾	44	50⅞	35⅞	74,000	774,200	Union Carbide & Carbon	No	9,000,743	2.90	3.06	2.28
88	96¾	68	78	46	50⅜	35	83,000	204,400	United Carbon	No	370,127	4.05	4.71	3.55
40	59	31¼	50⅝	35⅛	64¾	32	66,700	554,400	U. S. Indus. Alco.	No	391,033	None	2.16	4.04
23¾	27¼	16¼	21¾	11¼	31¾	14	36,400	505,000	Vanadium Corp.-Amer.	No	366,637	None	—1.13	—2.29
6½	8⅜	4⅛	4⅝	2½	5⅜	1⅞	20,600	413,400	Virginia-Caro. Chem.	No	486,000	None	*p*2.56	*p*—.79
44½	48¾	28¾	35¾	17½	26	10	25,100	294,200	6% cum. part. pfd.	100	213,392	None	*p*.16	*p*4.20
23¼	32	19¾	25½	16¾	27¼	14⅞	6,300	138,900	Westvaco Chlorine	No	284,962	1.00	1.63	1.55
31¾	35¼	31¾					6,000	13,400	Westvaco Chlorine, cum. pfd.	30	192,000	1.50	.....	.....
NEW YORK CURB EXCHANGE														
36	40¾	29¼	30	15	22½	14⅝	59,900	583,700	Amer. Cyanamid "B"	No	2,404,194	1.00	1.61	.99
2⅜	3¾	2⅜	4	2	4⅛	2⅜	1,100	11,000	British Celanese Am. R.	10	2,806,000	None	—.71%	—.58%
112	116¼	99¼	115	90	105¼	81	2,100	5,795	Celanese, 7% cum. 1st pfd.	100	144,379	7.00	21.96	16.37
109½	116	107¼	111¼	97½	102	83	2,900	11,150	7% cum. prior pfd.	100	263,668	7.00	35.34	28.13
10½	16½	9	15	7	19	7	300	9,800	Celluloid Corp.	15	194,952	None	—.95	—1.67
...	...	...	14½	11⅝	14⅜	10½	......	5,900	Courtaulds' Ltd.	1 £	24,000,000	7½%	7.51%	7.57%
135	135	94⅛	105½	80½	91	67½	6,500	65,800	Dow Chemical	No	945,000	2.40	4.42	3.32
8⅞	10¾	5	12½	6¼	10¾	4	15,700	118,800	Duval Texas Sulphur	No	500,000	.50	.16	*z* .25
43	55	39	58	37	40¾	19	500	8,100	Heyden Chem. Corp.	10	147,600	2.25	3.22	3.07
133½	140	98¼	97¼	46¾	57½	39	6,300	71,840	Pittsburgh Plate Glass	25	2,141,305	6.00	5.32	2.69
141	145½	117	128⅞	84	90½	47¼	4,950	71,200	Sherwin Williams	25	635,583	4.00	.....	*y*6.19
111	116	110	113½	106	109¾	100	70	4,760	5% pfd. cum.	100	155,521	5.00	.....	*y*33.17
PHILADELPHIA STOCK EXCHANGE														
170	179	114¼	116¾	76½	75	50¼	625	3,925	Pennsylvania Salt	50	150,000	8.50	*v*8.57	*v*5.94

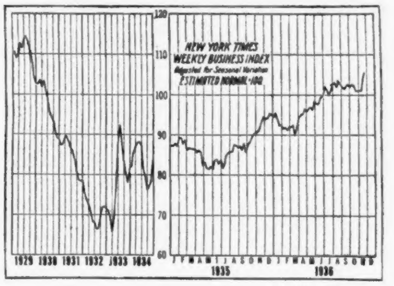
1936 November Last	1936 November High	1936 November Low	1935 High	1935 Low	1934 High	1934 Low	Sales Nov. 1936	Sales 1936	Bonds	Date Due	Int. %	Int. Period	Outstanding $
NEW YORK STOCK EXCHANGE													
110⅛	117½	109½	116	104½	106¾	83⅞	285,000	4,094,000	Amer. I. G. Chem. Conv. 5½'s	1949	5½	M. N.	29,929,000
39½	39½	27½	29¾	7⅜	17¾	5	423,000	2,260,000	Anglo Chilean Nitrate inc. deb.	1967	4½-5		12,433,000
100⅜	101¾	92½	94½	77⅜	88	61½	68,000	1,013,000	By-Products Coke Corp. 1st 5½'s "A"	1945	5½	M. N.	4,932,000
100	102¾	96¾	100¼	91⅛	92	62	101,000	1,058,000	Int. Agric. Corp. 1st Coll. tr. stpd. to 1942	1942	5	M. N.	5,994,100
33¾	35¾	21	21½	7	19½	5⅛	531,000	11,318,000	Lautaro Nitrate conv. b's	1954	6	J. J.	31,357,000
99	99½	66½	94	65	98½	89⅞	149,000	288,000	Montecatini Min. & Agric. deb. 7's with war.	1937	7	J. J.	7,075,045
...	...	...	38	32⅛	74½	34½	......	53,000	Ruhr Chem. 6's	1948	6	A. O.	3,156,000
104½	105	103	104	91½	90	65½	14,000	461,000	Tenn. Corp. deb. 6's "B"	1944	6	M. S.	3,007,900
92	96⅞	85¾	94¼	66	89½	62	61,000	1,214,000	Vanadium Corp. conv. 5's	1941	5	A. A.	4,261,000

† Year ended 5-31-35; *p* Year ended 6-30-35; *v* Years ended 6-1-35 and 6-1-36; *y* Year ended 8-31-35; *z* Year ended 8-31-35; * Paid in 1936, including extras; *x* Year ended 10-31-35.

Industrial Trends

Business Activity at Highest Point Since '29—Retail Trade 15% Ahead—Electrical Consumption Sets New All-Time Record—10% Increase in Industrial Production Forecast for '37—

"November business was at the highest point since '29," states Roger W. Babson and there is little reason to disagree with the business sage from Babson Park. In a post-election boom business has moved



—N. Y. Times.

Business activity rose sharply in November to new recovery peak.

ahead to a new recovery peak, although a small let-down was detected in the last week of the month. A perfect tidal wave of dividends reported last month, setting an all-time record, reached the perfectly astonishing figure of over eight hundred million dollars. December aggregate is 300% above the same period a year ago, while disbursements so far for '36 are 50% ahead of last year. Pay rises and bonuses were granted to nearly 2,000,000 workers by about 300 large industrial companies.

In the face of such outpourings retail trade in December is confidently expected to come close to if not equal to the 1930 mark. However, it will take an increase of over 15% to reach this figure, and in some quarters doubts exist that this desirable volume will be accomplished. But, even if the Christmas trade fails of this objective, it is certain to be of very satisfactory proportions, probably 10% above last year. The latter figure is the one expected by Dept. of Commerce officials.

Favorable Outlook for Steel

The outlook for the steel industry continues very favorable. Consumption of electricity set a new all-time record for the week ended Nov. 21st when 2,196,175,000 kilowatt hours were reported, an increase of 12.4% over the corresponding week of last year. Wholesale trade, according to advices from all over the country, is running 22 to 25% ahead of the same period in '35. The various automobile shows indicate that the automobile industry is in for another great year, with the very strong possibility that '37 sales will be greater than '36. Freight car loadings are exceeding the corresponding weeks of last year by a wide margin, in some instances as high as 24%.

The Times Index of Business Activity jumped sharply in November. On Oct. 31st the index stood at 101.1, while on Nov. 21st it was reported at 105.6, a high point in the swing away from the depression. The Associated Press seasonally adjusted index in the last week of the month reached 98.8, as compared with 84.9 in the same period a year ago. Wholesale commodity prices were higher last month, all accepted indices showing wide gains.

The N. Y. Journal of Commerce in a national survey reports that 14 industries will enjoy all-time record production in '36 and 6 others will report output above '30 and approaching '29 levels. In the first group are the plastics and cellulose trades, air conditioning, rayon, aluminum, paper, rubber, and shoes. The second group contains the chemical industry, steel, automotive, cotton textile, and glass fields. In certain divisions of the chemical field new record outputs will certainly be reported.

A number of careful observers are now predicting that there will be no important recession in business for at least two months. Many believe that business now is at "normal" and that we are really entering a "boom" era; that business will continue to improve throughout the first quarter of next year at least. The spending wave which has developed since the election, plus the bright outlook for several of the basic industries, are the chief reasons for the change in viewpoint. Nearly all branches of the textile field are assured of favorable operations in the first part of '37. The late start on '37 automotive production would certainly indicate that production will not decline as sharply in January and February as was the case in '36. The one unfavorable possibility is labor unrest despite the widespread wage increases granted by industry. Fortunately the chemical field is practically free of trouble of this nature.

10% Gain for '37

The Dept. of Agriculture in its recently issued Annual Outlook Reports forecasts a continuation of the rise in the effective domestic demand for farm products next year, reflecting an expected increase of 10% in industrial production and also in national income. If the forecast is realized industrial production in '37 will be the highest recorded with the single exception of '29.

Statistics of Business

	October 1936	October 1935	September 1936	September 1935	August 1936	August 1935
Automotive Production	224,628	272,043	135,130	87,540	271,291	237,400
Bldg. contracts*‡	$225,839	$200,595	$234,270	$167,376	$275,281	$168,557
Failures, Dun & Bradstreet	611	1,056	586	787	655	884
Merchandise imports‡	$215,525	$161,647	$215,525	$161,647	$195,016	$169,030
Merchandise exports‡	$219,967	$198,803	$219,967	$198,803	$178,249	$172,128
Newsprint Production						
Canada, tons	301,106	266,515	269,782	223,892	270,053	235,573
U. S., tons	81,027	79,746	72,216	71,416	73,673	75,187
Newfoundland, tons	30,677	29,744	28,329	27,161	29,301	29,565
Plate Glass prod., sq. ft.	20,752,657	16,592,803	19,552,775	14,404,060	18,710,040	
Steel ingots production, tons	4,545,001	3,142,759	4,161,000	2,825,000	4,195,130	2,915,930
Steel activity, % capacity	......	......	......	......	73.52	48.78
Pig iron production, tons	2,991,887	1,978,411	2,992,968	1,978,411	2,711,721	1,761,286
U. S. consumption, crude rubber, tons	49,509	41,969	46,330	37,086	46,657	38,775
Tire shipments	......	......	3,835,998	3,303,333	4,967,383	4,739,259
Tire production	......	......	4,981,131	3,786,873	5,014,415	3,992,800
Tire inventory	......	......	9,005,065	8,287,825	7,793,438	7,805,054
Dept. of Labor Indices†						
Factory payrolls, totals†	81 0	71.7	81.0	71.7	81.0	69.6
Factory employment†	88.9	81.9	88.9	81.9	88.7	81.8
Chemical employment†a	120.4	115.5	119.5	108.0	115.8	107.7
Chemical payrolls†a	114.5	103.0	112.0	98.8	113.2	110.5
Chemicals and Related Products						
Exports‡	......	......	$9,642	$9,016	$9,186	$9,375
Imports‡	......	......	$5,840	$4,618	$5,333	$3,767
Stocks, mfg. goods	......	......	130	120	115	114
Stocks, raw materials	......	......	96	98	75	79
Boot and shoe production	39,361,698	35,947,810	40,097,430	33,909,182	40,860,584	37,243,414

Week Ending	Carloadings 1936	Carloadings 1935	Carloadings % of Change	Electrical Output§ 1936	Electrical Output§ 1935	Electrical Output§ % of Change	Jour. of Com. Price Index	National Fertilizer Association Indices: Chem. & Drugs	Fats & Oils	Fert. Mat.	Mixed Fert.	All Groups	‡‡Labor Dept. Chem. & Drug Price Index	% Steel Activity	N. Y. Times Index Bus. Act.	Fisher's Index Pur. Power
Oct. 31	814,175	681,998	+19.4	2,175,810	1,897,180	+14.7	81.4	96.2	78.8	67.9	74.6	80.0	81.5	74.7	101.1	118.3
Nov. 7	759,318	654,947	+16.0	2,169,480	1,913,684	+13.4	82.5	96.3	79.4	67.9	74.6	80.2	81.6	74.0	101.3	118.1
Nov. 14	784,672	629,728	+24.6	2,169,715	1,938,560	+11.9	83.1	96.3	79.1	68.0	74.6	80.6	81.9	74.1	103.9	117.2
Nov. 21	789,500	647,924	+21.9	2,196,175	1,953,119	+12.4	83.2	96.5	80.2	68.0	74.7	81.0	82.5	74.3	105.6	116.1
Nov. 28	679,984	571,878	+18.9	2,133,511	1,876,684	+13.7	83.3	....	....	....	....	....	....	....	....	116.2

* 37 states; † Dept. of Labor, 3 year average, 1923-1925 = 100.0; ‡ 000 omitted; § K.W.H., 000 omitted; *a* Includes all allied products but not petroleum refining; ‡‡ 1926-1928 = 100.0; *y* Preliminary; *z* Revised.

Prices Current

Heavy Chemicals, Coal-tar Products, Dye-and-Tanstuffs, Colors and Pigments, Fillers and Sizes, Fertilizer and Insecticide Materials, Petroleum Solvents and Chemicals, Naval Stores, Fats and Oils, etc.

Chemical prices quoted are of American manufacturers for spot New York, immediate shipment, unless otherwise specified. Products sold f. o. b. works are specified as such. Import chemicals are so designated. Resale stocks when a market factor are quoted in addition to maker's prices and indicated "second hands."

Oils are quoted spot New York, ex-dock. Quotations f. o. b. mills, or for spot goods at the Pacific Coast are so designated.

Raw materials are quoted New York, f. o. b., or ex-dock. Materials sold f. o. b. works or delivered are so designated.

The current range is not "bid and asked," but are prices from different sellers, based on varying grades or quantities or both. Containers named are the original packages most commonly used.

Purchasing Power of the Dollar: 1926 Average—$1.00 - 1935 Average $1.21 - Jan. 1936 $1.19 - Nov. 1936 $1.17

	Current Market		1936 Low	1936 High	1935 Low	1935 High
Acetaldehyde, drs, c-l, wgs lb.	...	.14	...	.14	...	.14
Acetaldol, 95%, 50 gal drs wks ....lb.	.21	.25	.21	.25	.21	.25
Acetamide, tech, lcl, kegs..lb.	.38	.43	.38	.43	.38	.43
Acetanalid, tech, 150 lb bbls lb.	.24	.26	.24	.26	.24	.26
Acetic Anhydride, 100 lb cbys lb.	.21	.25	.21	.25	.21	.25
drs, f.o.b. wks, frt allowed ....lb.	...	.15	...	...	...	...
Acetin, tech, drs ....lb.	.22	.24	.22	.24	.22	.24
Acetone, tks, f.o.b. wks, frt allowed ....lb.	...	.06	.06	.12	.11	.12
drs, c-l, f.o.b. wks, frt allowed ....lb.	...	.07	.07	.12	...	.12
Acetyl chloride, 100 lb cbys lb.	.55	.68	.55	.68	.55	.68
ACIDS						
Abietic, kgs, bbls ....lb.	.06¼	.07	.06¼	.07	.06¼	.07
Acetic, 28%, 400 lb bbls, c-l, wks ....100 lbs.	...	2.45	...	2.45	2.40	2.45
glacial, bbls, c-l, wks 100 lbs.	...	8.43	...	8.43	8.25	8.43
glacial, USP, bbls, c-l, wks ....100 lbs.	...	12.43	...	12.43	12.25	12.43
Adipic, kgs, bbls ....lb.	...	.72	...	.72	...	.72
Anthranilic, refd, bbls ....lb.	.85	.95	.85	.95	.85	.95
tech, bbls ....lb.	...	.75	...	.75	...	.75
Battery, cbys, delv ...100 lbs.	1.60	2.25	1.60	2.25	1.60	2.25
Benzoic, tech, 100 lb kgs ..lb.	.40	.45	.40	.45	.40	.45
USP, 100 lb kgs ....lb.	.54	.59	.54	.59	.54	.59
Boric, tech, gran, 80 tons, bgs, delv ....ton *a*	...	95.00	...	95.00	80.00	95.00
Broenner's, bbls ....lb.	1.20	1.25	1.20	1.25	1.20	1.25
Butyric, 95%, cbys ....lb.	.53	.60	.53	.60	.53	.60
edible, c-l, wks, cbys ...lb.	1.20	1.30	1.20	1.30	1.20	1.30
synthetic, c-l, drs ....lb.	...	.22	...	.22	...	.22
wks ....lb.	...	.23	...	.23	...	.23
tks, wks ....lb.	...	.21	...	.21	...	.21
Camphoric, drs ....lb.	...	5.25	...	5.25	...	5.25
Chicago, bbls ....lb.	...	2.10	...	2.10	...	2.10
Chlorosulfonic, 1500 lb drs, wks ....lb.	.03½	.05	.03½	.05	.03½	.05½
Chromic, 99¾%, drs, delv lb.	.14¾	.16¾	.14¾	.16¾	.13¾	.16¾
Citric, USP, crys, 230 lb bbls ....lb. *b*	.25	.26	.25	.29	.28	.29
anhyd, gran, bbls ....lb. *b*	...	.29	.29	.31	...	.31
Cleve's, 250 lb bbls ....lb.	.52	.54	.52	.54	.52	.54
Cresylic, 99%, straw, HB, drs, wks, frt equal ..gal.	.72	.74	.51	.74	.46	.53
99%, straw, LB, drs, wks, frt equal ....gal.	.77	.79	.68	.79	.64	.68
resin grade, drs, wks, frt. equal ....lb.	.09	.09½	.52*y*	.65*y*	.52*y*	.55*y*
Crotonic, drs ....lb.	.90	1.00	.90	1.00	.90	1.00
Formic, tech, 140 lb drs ..lb.	.11	.13	.11	.13	.11	.13
Fumaric, bbls ....lb.	...	.60	...	.60	...	.60
Fuming, see Sulfuric (Oleum)						
Fuoric, tech, 90%, 100 lb. drs lb.	...	.35	...	.35	...	.35
Gallic, tech, bbls ....lb.	.65	.68	.65	.68	.65	.68
USP, bbls ....lb.	.70	.80	.70	.80	.70	.80
Gamma, 225 lb bbls, wks..lb.	.80	.84	.80	.84	.77	.79
H, 225 lb. bbls, wks....lb.	.50	.55	.50	.55	.50	.55
Hydriodic, USP, 10% sol. cbys ....lb.	.50	.51	.50	.51	.50	.51
Hydrobromic, 48% com 155 lb cbys, wks ....lb.	.45	.48	.45	.48	.45	.48
Hydrochloric, see muriatic.						
Hydrocyanic, cyl. wks ....lb.	.80	1.30	.80	1.30	.80	1.30
Hydrofluoric, 30%, 400 lb bbls, wks ....lb.	.07	.07½	.07	.07½	.07	.07½
Hydrofluosilicic, 35%, 400 bbls, wks ....lb.	.11	.12	.11	.12	.11	.12
Lactic, 22%, dark, 500 lb bbls lb.	.04½	.05	.04½	.05	.04½	.05
22%, light refd, bbls ...lb.	.06½	.07	.06½	.07	.06½	.07
44%, light, 500 lb bbls ..lb.	.11½	.12	.11½	.12	.11½	.12
44%, dark, 500 lb bbls ..lb.	.09½	.10	.09½	.10	.09½	.10
50%, water white, 500 lb bbls ....lb.	...	.14½	...	.14½	...	...
USP X, 85%, cbys ....lb.	.45	.50	.45	.50	.45	.50
Laurent's, 250 lb bbls ....lb.	.46	.47	.46	.47	.36	.37
Linoleic, bbls ....lb.	.16	.16	.16	.16	.16	.16
Maleic, powd, kgs ....lb.	.29	.32	.29	.32	.29	.32
Malic, powd, kgs ....lb.	.45	.60	.45	.60	.45	.60
Metanillic, 250 lb bbls ....lb.	.60	.65	.60	.65	.60	.65
Mixed, tks, wks ....N unit	.06½	.07¼	.06½	.07¼	.06½	.07¼
S unit	.008	.009	.008	.009	.008	.009
Monochloracetic, tech, bbls lb.	.16	.18	.16	.18	.16	.18
Monosulfonic, bbls ....lb.	1.50	1.60	1.50	1.60	1.50	1.60

a Powdered boric acid $5 a ton higher in each case; USP $15 higher; *b* Powdered citric is ½c higher; kegs are in each case ½c higher than bbls. *y* Price given is per gal.

	Current Market		1936 Low	1936 High	1935 Low	1935 High
Muriatic, 18°, 120 lb cbys, c-l, wks ....100 lb.	...	1.35	...	1.35	...	1.35
tks, wks ....100 lb.	...	1.00	...	1.00	...	1.00
20°, cbys, c-l, wks ..100 lb.	...	1.45	...	1.45	...	1.45
tks, wks ....100 lb.	...	1.20	...	1.20	...	1.20
22°, c-l, cbys, wks ..100 lb.	...	1.95	...	1.95	...	1.95
tks, wks ....100 lb.	...	1.60	...	1.60	...	1.60
CP, cbys ....lb.	.06½	.07⅛	.06½	.07⅛	.06½	.07⅛
N & W, 250 lb bbls ....lb.	.85	.87	.85	.87	.85	.87
Naphthenic, 240-280 s.v., drs lb.	.11	.14	.11	.14	.11	.14
Sludges, drs ....lb.	.06	.10	.06	.10	...	...
Naphthionic, tech, 250 lb bbls ....lb.	.60	.65	.60	.65	.60	.65
Nitric, 36°, 135 lb cbys, c-l, wks ....100 lb. *c*	...	5.00	...	5.00	...	5.00
38°, c-l, cbys, wks..100 lb. *c*	...	5.50	...	5.50	...	5.50
40°, cbys, c-l, wks..100 lb. *c*	...	6.00	...	6.00	...	6.00
42°, c-l, cbys, wks..100 lb. *c*	...	6.50	...	6.50	...	6.50
CP, cbys, delv....lb.	.11½	.12½	.11½	.12½	.11½	.12½
Oxalic, 300 lb bbls, wks, or N. Y. ....lb.	.11½	.12½	.11½	.12½	.11½	.12½
Phosphoric, 50%, USP, cbys ....lb.	.14	.14	.14	.14	.14	.14
50%, acid, c-l, drs, wks..lb.	.06	.08	.06	.08	.06	.08
75%, acid, c-l, drs, wks..lb.	.09	.10½	.09	.10½	.09	.10½
Picramic, 300 lb bbls, wks.lb.	.65	.70	.65	.70	.65	.70
Picric, kgs, wks ....lb.	.30	.40	.30	.40	.30	.40
Propionic, 98% wks, drs..lb.	...	.35	...	.35	...	.35
80% ....lb.	.15	.17½	.15	.17½	.15	.17½
Pyrogallic, crys, kgs, wks..lb.	1.55	1.65	1.55	1.65	1.55	1.65
Salicylic, tech, 125 lb bbls, wks ....lb.	...	.40	...	.40	...	.40
Sebacic, tech, drs, wks ....lb.	...	.58	...	.58	...	.58
Succinic, bbls ....lb.	...	.75	...	.75	...	.75
Sulfanilic, 250 lb bbls, wks lb.	.17	.18	.17	.19	.18	.19
Sulfuric, 60°, tks, wks ..ton	...	11.00	...	11.00	...	11.00
c-l, cbys, wks ....100 lb.	...	1.10	...	1.10	...	1.10
66°, tks, wks ....ton	...	15.50	...	15.50	...	15.50
c-l, cbys, wks ....100 lb.	...	1.35	...	1.35	...	1.35
CP, cbys, wks ....lb.	.06½	.07½	.06½	.07½	.06½	.07½
Fuming (Oleum) 20% tks, wks ....ton	...	18.50	...	18.50	...	18.50
Tannic, tech, 300 lb bbls...lb.	.19	.36	.19	.40	.23	.40
Tartaric, USP, gran powd, 300 lb bbls ....lb.	...	.24	...	.24	.24	.25
Tobias, 250 lb bbls ....lb.	.70	.72½	.70	.72½	.70	.80
Trichloroacetic bottles ....lb.	2.45	2.75	2.45	2.75	2.45	2.75
kgs ....lb.	...	1.75	...	1.75	...	1.75
Tungstic, tech, bbls ....lb.	1.50	1.60	1.50	1.60	1.50	1.60
Vanadic, drs, wks ....lb.	1.10	1.20	1.10	1.20	1.10	1.20
Albumen, light flake, 225 lb bbls ....lb.	.50	.60	.50	.60	.45	.60
dark, bbls ....lb.	.12	.17	.12	.17	.12	.17
egg, edible ....lb.	.77	.79	.77	1.05	.85	1.05
vegetable, edible ....lb.	.65	.70	.65	.70	.65	.70
ALCOHOLS						
Alcohol, Amyl (from Pentane) tks, delv ....lb.	...	.143	...	.143	...	...
c-l, drs, delv ....lb.	...	.150	...	.150	...	...
lcl, drs, delv ....lb.	...	.157	...	.157	...	...
Amyl, secondary, tks, delv ....lb.	...	.108	...	.108	...	.108
Benzyl, bottles ....lb.	.65	1.10	.65	1.10	.65	1.10
Butyl, normal, tks, f.o.b. wks, frt allowed....lb. *d*	...	.08½	.08½	.11	.11	.12
c-l, drs, f.o.b. wks, frt allowed ....lb. *d*	...	.09½	.09½	.12	.12	.13
Butyl, secondary, tks, delv ....lb. *d*	...	.07½	.07½	.096	...	.096
c-l, drs, delv ....lb. *d*	...	.08½	.08½	.106	...	.106
Capryl, drs, tech, wks ..lb.	...	.85	...	.85	...	.85
Cinnamic, bottles ....lb.	2.50	3.65	2.50	3.65	3.25	3.65
Denatured, CD, No. 11, 12, 13, tks, c-l, drs, wks gal. *e*	...	.33	.30	.44*	.34	.49*
Western schedule, c-l, wks ....gal. *e*	...	.39	.39	.52*	.38	.52*
Denatured, SD, No. 1, tks, c-l, tks	...	.26	.23	.28	.29½	.31
c-l, drs, wks ....gal. *e*	...	.29	.29	.34	.34½	.36
Diacetone, tech, tks, delv lb. *f*	...	.16	...	.16	...	.16
c-l, drs, delv ....lb. *f*	...	.17	...	.17	...	.17

c Yellow grades 25c per 100 lbs. less in each case; *d* Spot prices are 1c higher; *e* Anhydrous is 5c higher in each case; *f* Pure prices are 1c higher in each case; * Dealers were given 20% off this price.

ABBREVIATIONS—Anhydrous, anhyd; bags, bgs; barrels, bbls; carboys, cbys; carlots, c-l; less-than-carlots, lcl; drums, drs; kegs, kgs; powdered, powd; refined, ref'd; tanks, tks; works, f.o.b., wks.

	Current Market		1936 Low	1936 High	1935 Low	1935 High
Alcohols (continued)						
Ethyl, 190 proof, molasses,						
tks ....gal. g	...	4.07	4.07	4.10	4.08½	4.10
c-l, drs ....gal. g	...	4.11	4.11	4.27	4.13½	4.27
c-l, bbls ....gal. g	...	4.12	4.12	4.28	4.15½	4.28
absolute, drs ......gal. g	4.54	6.08½	4.54	6.11½	4.55½	6.11½
Furfuryl, tech, 500 lb drs lb.	...	.35	...	.35	...	.35
Hexyl, secondary tks, delv						
........lb.	...	.11½	...	.11½	...	.11½
c-l, drs, delv ....lb.	...	.12½	...	.12½	...	.12½
Normal, drs, wks ....lb.	3.25	3.50	3.25	3.50	3.25	3.50
Isoamyl, prim, cans, wks lb.	...	.32	...	.32	...	...
drs, lcl, delvd ....lb.	...	.27	...	.27	...	...
Isobutyl, refd, lcl, drs ..lb.	...	.10	.10	.12	.12	.60
c-l, drs ....lb.	...	.09½	.09½	.11½	...	...
tks ....lb.	...	.08½	.08½	.10½	...	...
Isopropyl, refd, c-l, drs,						
f.o.b. wks, frt allowed..lb.	...	.55	...	.55	...	.55
Propyl, norm, 50 gal drs gal.	...	.75	...	.75	...	.75
Special Solvent, tks, wks gal.	...	.27	.24	.32	...	...
Aldehyde ammonia, 100 gal						
drs ....lb.	.80	.82	.80	.82	.80	.82
Alphanaphthol, crude, 300 lb						
bbls ....lb.	.60	.65	.60	.65	.60	.65
Alphanaphthylamine, 350 lb						
bbls ....lb.	.32	.34	.32	.34	.32	.34
Alum, ammonia, lump, c-l,						
bbls, wks ....100 lb.	...	3.00	...	3.00	...	3.00
25 bbls or more, wks 100 lb.	...	3.15	...	3.15	...	3.15
less than 25 bbls, wks 100 lb.	...	3.25	...	3.25	...	3.25
Granular, c-l, bbls,						
wks ....100 lb.	...	2.75	...	2.75	...	2.75
25 bbls or more, wks 100 lb.	...	2.90	...	2.90	...	2.90
Powd, c-l, bbls, wks 100 lb.	...	3.15	...	3.15	...	3.15
25 bbls or more, wks 100 lb.	...	3.30	...	3.30	...	3.30
Chrome, bbls ....100 lb.	7.00	7.25	7.00	7.25	7.00	7.25
Potash, lump, c-l, bbls,						
wks ....100 lb.	...	3.25	...	3.25	...	3.25
25 bbls or more, wks 100 lb.	...	3.40	...	3.40	...	3.40
Granular, c-l, bbls,						
wks ....100 lb.	...	3.40	...	3.40	...	3.00
25 bbls or more, bbls,						
wks ....100 lb.	...	3.00	...	3.00	...	3.15
Powd, c-l, bbls, wks 100 lb.	...	3.40	...	3.40	...	3.40
25 bbls or more, wks 100 lb.	...	3.55	...	3.55	...	3.55
Soda, bbls, wks ....100 lb.	4.00	4.15	4.00	4.15	4.00	4.15
Aluminum metal, c-l, NY 100 lb.	19.00	20.00	19.00	20.00	19.00	23.30
Acetate, CP, 20%, bbls lb.	.09	.10	.09	.10	.09	.10
Chloride anhyd, 99%, wks lb.	.07	.12	.07	.12	.07	.12
93%, wks ....lb.	.05	.08	.05	.08	.05	.08
Crystals, c-l, drs, wks ..lb.	.06½	.07	.06½	.07	.06½	.07
Solution, drs, wks ......lb.	.03	.03½	.03	.03½	.03	.03½
Hydrate, 96%, light, 90 lb.						
bbls, delv ....lb.	.13	.15	.13	.15	.13	.15
heavy, bbls, wks .....lb.	.04	.04½	.04	.04½	.04	.04½
Oleate, drs ....lb.	.16¾	.18½	.15¾	.18½	...	.15¾
Palmitate, bbls ....lb.	.21	.22	.21	.22	.20	.22
Resinate, pp., bbls .....lb.	...	.15	...	.15	...	.15
Stearate, 100 lb bbls ...lb.	.19	.21	.18	.21	.17	.20
Sulfate, com, c-l, bgs,						
wks ....100 lb.	...	1.35	...	1.35	...	1.35
c-l, bbls, wks .....100 lb.	...	1.55	...	1.55	...	1.55
Sulfate, iron-free, c-l, bgs,						
wks ....100 lb.	...	1.90	...	1.90	...	1.90
c-l, bbls, wks ....100 lb.	...	2.05	...	2.05	...	2.05
Aminoazobenzene, 110 lb kgs						
........lb.	...	1.15	...	1.15	...	1.15
Ammonia anhyd com, tks..lb.	.04½	.05½	.04½	.05½	.04½	.05½
Ammonia anhyd, 100 lb cyl lb.	.15½	.21½	.15½	.21½	.15½	.21½
26°, 800 lb drs, delv ....lb.	.02½	.03	.02½	.03	.02½	.03
Aqua 26°, tks, NH ..cont.	...	.05	...	.05	...	.05
tk wagon ....lb.	...	.024	...	.024	...	.024
Ammonium Acetate, kgs ..lb.	.26	.33	.26	.33	.26	.33
Bicarbonate, bbls, f.o.b.						
plant ....100 lb.	5.15	5.71	5.15	5.71	5.15	5.71
Bifluoride, 300 lb bbls ..lb.	.16	.17	.15	.17	.15	.17
carbonate, tech, 500 lb						
bbls ....lb.	.08	.12	.08	.12	.08	.12
Chloride, White, 100 lb						
bbls, wks ....100 lb.	4.45	4.90	4.45	4.90	4.45	4.90
Gray, 250 lb bbls, wks ..lb.	5.00	5.75	5.00	5.75	5.00	5.75
Lump, 500 lbs cks spot lb.	.10½	.11	.10½	.11	.10½	.11
Lactate, 500 lb bbls ....lb.	.15	.16	.15	.16	.15	.16
Linoleate ....lb.	.11	.12	.11	.12	.11	.12
Nitrate, tech, cks ......lb.	.04	.05	.04	.05	.04	.05
Oleate, drs ....lb.	...	.10	...	.10	...	.10
Oxalate, neut, cryst, powd,						
bbls ....lb.	.26	.27	.26	.27	.26	.27
pure, cryst, bbls, kgs..lb.	.27	.28	.27	.28	.27	.28
Perchlorate, kgs ....lb.	...	.16	...	.16	...	.16
Persulfate, 112 lb kgs ..lb.	.21	.24	.21	.25	.22½	.25
Phosphate, dibasic tech,						
powd, 325 lb bbls ....lb.	.07½	.10	.07½	.10	.08	.10
Stearate, drs ....lb.	...	26.00	22.00	26.00	...	...
Sulfate, dom, f.o.b., bulk ton	...	25.50	22.00	26.00	20.00	24.00
200 lb bgs ....ton	...	nom.	...	nom.	25.50	25.80
100 lb bgs ....lb.	...	nom.	...	nom.	26.00	26.50
Sulfocyanide, kgs ......lb.	...	.55	...	.55	...	.50
Amyl Acetate (from pentane)						
tks, delv ....lb.	...	.13½	...	.13½	...	.13½
tech, drs, delv ......lb.	.142	.149	.142	.149	.142	.149
secondary, tks, delv ..lb.	...	.108	...	.108	...	.108
c-l, drs, delv ....lb.	.118	.123	.118	.123	.118	.123
Amyl Chloride, norm drs, wks lb.	.56	.68	.56	.68	.56	.68
Chloride, mixed, drs, wks lb.	.07	.077	.07	.077	.07	.077
tks, wks ....lb.	...	.06	...	.06	...	.06
Mercaptan, drs, wks ....lb.	...	1.10	...	1.10	...	1.10
Oleate, lcl, wks, drs....lb.	...	.25	...	...	...	...
Stearate, lcl, wks, drs...lb.	...	.26	...	...	...	...

g Grain alcohol 20c a gal. higher in each case.

	Current Market		1936 Low	1936 High	1935 Low	1935 High
Amylene, drs, wks ....lb.	.102	.11	.102	.11	.102	.11
tks, wks ....lb.	...	.09	...	.09	...	.09
Aniline Oil, 960 lb drs and						
tks ....lb.	.15	.17½	.15	.17½	.15	.17½
Annatto fine ....lb.	.34	.37	.34	.37	.34	.37
Anthracene, 80% ....lb.	...	.75	...	.75	...	.75
40% ....lb.	...	.18	...	.18	...	.18
Anthraquinone, sublimed, 125						
lb bbls ....lb.	.50	.52	.50	.52	.50	.52
Antimony metal slabs, ton						
lots ....lb.	...	.12	.11⅜	.13½	.12½	.16
Needle, powd, bbls .....lb.	.11½	.12	.11	.12½	.09	.13½
Butter of, see Chloride.						
Chloride, soln cbys .....lb.	.13	.17	.13	.17	.13	.17
Oxide, 500 lb bbls ......lb.	.12¼	.13	.12¼	.14	.10¼	.15
Salt, 63% to 65%, tins..lb.	.22	.24	.22	.24	.22	.24
Sulfuret, golden, bbls...lb.	.22	.23	.22	.23	.19	.23
Vermilion, bbls ....lb.	.35	.42	.35	.42	.35	.42
Archil, conc, 600 lb bbls ..lb.	.21	.27	.21	.27	.21	.27
Double, 600 lb bbls .....lb.	.18	.20	.18	.20	.18	.20
Triple, 600 lb bbls .....lb.	.18	.20	.18	.20	.18	.20
Argols, 80%, casks ......lb.	.14	.15	.14	.15	.15	.16
Crude, 30%, casks .....lb.	.07	.08	.07	.08	.07	.08
Aroclors, wks ....lb.	.18	.30	.18	.30	.18	.30
Arrowroot, bbl ....lb.	.08¾	.09¾	.08¾	.09¾	.08¾	.09¾
Arsenic, Red, 224 lb cs kgs lb.	...	.15¾	...	.15¾	...	.15¾
White, 112 lb kgs ......lb.	.03½	.04½	.03½	.04½	.03½	.04½
Metal ....lb.	.42	.44	.40	.44	.40	.42
Asbestine, c-l, wks ......ton	13.00	15.00	13.00	15.00	13.00	15.00
Barium Carbonate precip,						
200 lb bgs, wks .....ton	56.50	61.00	56.50	61.00	56.50	61.00
Nat (witherite) 90% gr,						
c-l, wks, bgs ....ton	42.00	45.00	42.00	45.00	42.00	45.00
Chlorate, 112 lb kgs NY lb.	.15½	.17½	.15½	.17½	.14	.17½
Chloride, 600 lb bbl, wks ton	72.00	74.00	72.00	74.00	72.00	74.00
Dioxide, 88%, 690 lb drs lb.	.11	.12	.11	.12	.11	.12
Hydrate, 500 lb bbls ....lb.	.05¼	.06	.05¼	.06	.05½	.06
Nitrate, bbls ....lb.	...	.07	.07	.08¼	...	.08¼
Barytes, floated, 350 lb bbls						
wks ....ton	23.65	31.15	23.65	31.15	23.00	31.15
Bauxite, bulk, mines .....ton	7.00	10.00	7.00	10.00	7.00	10.00
Bentonite, c-l, No. 1, bgs,						
wks ....ton	...	16.50	...	16.50	16.50	18.00
No. 2 ....ton	...	11.00	...	11.00	11.00	12.50
Benzaldehyde, tech, 945 lb						
drs, wks ....lb.	.60	.62	.60	.62	.60	.62
Benzene (Benzol), 90%, Ind,						
8000 gal tks, frt allowed						
........gal.	...	.16	.16	.18	.15	.18
90% c-l, drs ....gal.	...	.23	...	.23	.23	.24
Ind Pure, tks, frt allowed						
........gal.	...	.16	.16	.18	.15	.18
Benzidine Base, dry, 250 lb						
bbls ....lb.	.72	.74	.72	.74	.67	.69
Benzoyl Chloride, 500 lb drs lb.	.40	.45	.40	.45	.40	.45
Benzyl Chloride, tech, drs..lb.	.30	.40	.30	.40	.30	.40
Beta-Naphthol, 250 lb bbl,						
wks ....lb.	.24	.27	.24	.27	...	.24
Naphthylamine, sublimed,						
200 lb bbls ....lb.	1.25	1.35	1.25	1.35	1.25	1.35
Tech, 200 lb bbls ......lb.	.53	.55	.53	.55	.53	.55
Bismuth metal ....lb.	1.00	1.10	1.00	1.10	.90	1.20
Chloride, boxes ....lb.	3.20	3.25	3.20	3.25	3.20	3.25
Hydroxide, boxes ......lb.	3.15	3.20	3.15	3.20	3.15	3.20
Oxychloride, boxes .....lb.	2.95	3.00	2.95	3.00	2.95	3.00
Subbenzoate, boxes .....lb.	3.25	3.30	3.25	3.30	3.25	3.30
Subcarbonate, kgs ......lb.	1.40	1.45	1.40	1.45	1.55	1.70
Trioxide, powd, boxes...lb.	3.45	3.50	3.45	3.50	3.45	3.50
Subnitrate	1.30	1.35	1.30	1.35	1.30	1.45
Blackstrap, cane (see Molasses, Blackstrap).						
Blanc Fixe, 400 lb bbls,						
wks ....ton *h*	42.50	70.00	42.50	70.00	42.50	70.00
Bleaching Powder, 800 lb drs,						
c-l, wks, contract..100 lb.	...	2.00	...	2.00	1.90	2.00
lcl, drs, wks ....lb.	2.25	3.60	2.25	3.60	2.15	3.60
Blood, dried, f.o.b., NY..unit	...	3.90	2.50	4.25	2.50	3.25
Chicago, high grade ...unit	...	4.25	2.90	4.50	2.50	3.75
Imported shipt ....unit	...	3.85	2.60	3.75	2.75	3.30
Blues, Bronze Chinese Milori						
Prussian Soluble ....lb.	.37	.38½	.37	.38½	.36½	.38
Ultramarine,* dry, wks,						
bbls ....lb.	...	.10	...	.10	...	...
Regular grade, group 1 lb.	...	.15	...	.15	...	...
Special, group 1.......lb.	...	.18	...	.18	...	...
Pulp, No. 1 ....lb.	...	.26	...	.26	...	...
Bone, 4½ + 50% raw,						
Chicago ....ton	22.00	23.00	20.00	25.00	19.00	22.00
Bone Ash, 100 lb kgs .....lb.	.06	.07	.06	.07	.06	.07
Black, 200 lb bbls ......lb.	.05½	.08¼	.05½	.08¼	.05½	.08¼
Meal, 3% & 50%, imp..ton	...	24.75	23.00	25.00	22.75	24.00
Domestic, bgs, Chicago..ton	...	18.50	16.00	20.00	16.00	21.00
Borax, tech, gran, 80 ton lots,						
sacks, delv ....ton *i*	...	40.00	...	40.00	36.00	40.00
bbls, delv ....ton *i*	...	50.00	...	50.00	46.00	50.00
c-l, sacks, delv ......ton *i*	...	44.00	...	44.00	40.00	44.00
c-l, bbls, delv ....ton *i*	...	54.00	...	54.00	50.00	54.00
Tech, powd, 80 ton lots,						
sacks ....ton *i*	...	45.00	...	45.00	41.00	45.00
bbls, delv ....ton *i*	...	56.00	...	56.00	51.00	56.00
c-l, sacks, delv ......ton *i*	...	49.00	...	49.00	45.00	49.00
c-l, bbls, delv ....ton *i*	...	59.00	...	59.00	55.00	59.00
Bordeaux Mixture, jobbers,						
East, c-l, tins, drs, cases lb.	.08	.16	.08	.16	.08	.16
Jobbers, West, c-l ......lb.	.08	.10	.08	.10	.08	.10
Dealers, East, c-l ......lb.	.08½	.16½	.08½	.16½	.08½	.16½
Dealers, West, c-l ......lb.	.09	.11	.09	.11	.09	.11

h Lowest price is for pulp, highest for high grade precipitated; *i* Crystals $6 per ton higher; USP, $15 higher in each case; * Freight is equalized in each case with nearest producing point.

	Current Market		1936 Low	1936 High	1935 Low	1935 High
Bromine, cases ....lb.	.30	.43	.30	.43	.30	.43
Bronze, Al, pwd, 300 lb drs lb.	.80	1.50	.80	1.50	.80	1.50
Gold, blk ....lb.	.40	.55	.40	.55	.40	.55
Butanes, com 16-32° group 3 tks ....lb.	...	.04	...	.04	...	.04
Butyl, Acetate, norm drs, frt allowed ....lb.	.09½	.10	.09½	.12½	.12	.13½
tks, frt allowed ....lb.	...	.08½	.08½	.11	.11	.13
Secondary, tks, frt allowed ....lb.	...	.07½	.07½	.096	...	.096
drs, frt, allowed .....lb.	.08½	.09	.106	.111	.106	.111
Aldehyde, 50 gal drs, wks ....lb.	.19	.21	.19	.21	.19	.21
Carbinol, norm drs, wks lb.	.60	.75	.60	.75	.60	.75
Lactate, drs ....lb.	.22½	.23½	.22½	.23½	.22½	.23½
Propionate, drs ....lb.	.18	.18½	.18	.18½	.18	.18½
tks, delv ....lb.	...	.17	...	.17	...	.17
Stearate, 50 gal drs ....lb.	...	.26	...	.26	...	.26
Tartrate, drs ....lb.	.55	.60	.55	.60	.55	.60
Butyraldehyde, drs, lcl, wks lb.	...	.35½	...	...	...	...
Cadmium, Sulfide, boxes...lb.	.90	1.00	.90	1.10	.75	.85
Cadmium Metal ....lb.	...	1.05	.75	1.05	.55	.90
Calcium, Acetate, 150 lb bgs c-l, delv ....100 lb.	...	2.10	...	2.10	2.00	2.10
Arsenate, jobbers, East of Rocky Mts, drs ......lb.	.06	.06⅜	.06	.06⅜	.06	.06½
dealers, drs ....lb.	.06¼	.07¾	.06¼	.07¾	.06¼	.07¾
South, jobbers, drs .....lb.	.06	.06½	.06	.06½	.06	.06½
dealers, drs ....lb.	.06½	.06¾	.06½	.06¾	.06¼	.06¾
Carbide, drs ....lb.	.05	.06	.05	.06	.05	.06
Carbonate, tech, 100 lb bgs c-l ....lb.	1.00	1.00	1.00	1.00	1.00	1.00
Chloride, flake, 375 lb drs, c-l, delv. ....ton	...	22.00	...	22.00	...	19.50
Solid, 650 lb drs, c-l, delv. ....ton	...	20.00	..	20.00	...	17.50
Ferrocyanide, 350 lb bbls wks ....lb.	...	.17	...	.17	...	.17
Gluconate, Pharm, 125 lb bbls ....lb.	.50	.57	.50	.57	...	...
Nitrate, 100 lb bgs ....ton	...	26.50	...	26.50	...	26.50
Palmitate, bbls ....lb.	.21	.22	.21	.22	.20	.22
Peroxide, 100 lb drs ....lb.	...	1.25	...	1.25	...	1.25
Phosphate, tech, 450 lb bbls ....lb.	.07½	.08	.07½	.08	.07½	.08
Resinate, precip, bbls ...lb.	.13	.14	.13	.14	.13	.14
Stearate, 100 lb bbls ...lb.	.19	.21	.18	.21	.17	.20
Camphor, slabs ....lb.	...	.52	.50	.56	.49	.57
Powder ....lb.	...	.52	.4940	.56	.50	.57
Camwood, Bk, ground bbls lb.	.16	.18	.16	.18	.16	.18
Carbon, Decolorizing, drs c-l ....lb.	.08	.15	.08	.15	.08	.15
Black, c-l, bgs, delv, price varying with zone ....lb.	.0445	.0535	.0445	.0535	.0445	.0535
lcl, bgs, delv, all zones lb.	...	.07	...	.07	...	.07
cartons, delv ......lb.	...	.07¾	...	.07¾	...	.07¾
cases, delv ....lb.	...	.08¼	...	.08¼	...	.08¼
Bisulfide, 500 lb drs ....lb.	.05¼	.08	.05¼	.08	.05¼	.08
Dioxide, Liq 20-25 lb cyl lb.	.06	.08	.06	.08	.06	.08
Tetrachloride, 1400 lb drs, delv ....lb.	.05¼	.06	.05¼	.06	.05¼	.06
Casein, Standard, Dom, grd lb.	.17	.18¼	.14½	.18¾	.09½	.16¾
80-100 mesh, c-l, bgs....lb.	.17½	.18¼	.15	.19¾	.10	.17¼
Castor Pomace, 5½ NH_3, c-l, bgs, wks ....ton	...	18.50	15.00	18.50	16.00	18.50
Imported, ship, bgs ....ton	...	17.00	17.00	18.00	17.25	20.00
Celluloid, Scraps, ivory cs lb.	.17	.18	.17	.18	.17	.18
Transparent, cs ....lb.	...	.20	...	.20	...	.20
Cellulose, Acetate, 50 lb kgs ....lb.	.55	.60	.55	.60	.55	.60
Chalk, dropped, 175 lb bbls lb.	.03	.03¾	.03	.03¾	.03	.03¾
Precip, heavy, 560 lb cks lb.	.03	.04	.03	.04	.03	.04
Light, 250 lb cks ....lb.	.03	.04	.03	.04	.03	.04
Charcoal, Hardwood, lump, blk, wks ....bu.	...	.15	...	.15	...	.15
Willow, powd, 100 lb bbl, wks ....lb.	.06	.06¼	.06	.06¼	.06	.06¼
bgs, delv* ....ton	24.40	25.40	24.40	25.40	22.40	30.00
Chestnut, clarified bbls, wks lb.	...	.01625	.01625	.01⅞	...	.01⅞
25%, tks, wks ....lb.	...	.02	.01½	.02	...	.01½
Pwd, 60%, 100 lb bgs. wks ....lb.	...	.04⅞	...	.04⅞	...	.04⅞
China Clay, c-l, blk mines ton	...	7.00	...	7.00	...	7.00
Powdered, bbls ....lb.	.01	.02	.01	.02	.01	.02
Pulverized, bbls, wks ..ton	10.00	12.00	10.00	12.00	10.00	12.00
Imported, lump, blk ...ton	15.00	25.00	15.00	25.00	15.00	25.00
Chlorine, cyls, lcl, wks, contract ....lb.	.07½	.08½	.07½	.08½	.07½	.08½
cyls, c-l, contract ...lb. j	...	.05½	...	.05½	...	.05½
Liq, tk, wks, contract 100 lb.	...	2.15	...	2.15	2.00	2.15
Multi, c-l, cyls, wks, cont ....lb.	2.30	2.55	2.30	2.55	2.30	2.40
Chloroacetophenone, tins, wks ....lb.	...	2.00	...	2.00	...	2.00
Chlorobenzene, Mono, 100 lb drs, lcl, wks ....lb.	.06	.07½	.06	.07½	.06	.07½
Chloroform, tech, 1000 lb drs ....lb.	.20	.21	.20	.21	.20	.21
USP, 25 lb tins ....lb.	.30	.31	.30	.31	.30	.31
Chloropicrin; comml cyls..lb.	.85	.90	.85	.90	.85	.90
Chrome, Green, CP ......lb.	.18½	.21½	.21½	.21½	.17	.30
Yellow ....lb.	.12	.13	.11	.13	.11	.16
Chromium, Acetate, 8% Chrome, bbls ....lb.	.06	.08	.06	.08	.05	.05¼
20° soln, 400 lb bbls ...lb.	...	.05½	...	.05½	...	.05½
Fluoride, powd, 400 lb bbl ....lb.	.27	.28	.27	.28	.27	.28

j A delivered price; * Depends upon point of delivery.

Current

Coal Tar
Diphenylguanidine

	Current Market		1936 Low	1936 High	1935 Low	1935 High
Coal tar, bbls ....bbl.	7.25	9.00	7.25	9.00	7.25	9.00
Cobalt Acetate, bbls ......lb.	...	.58	.58	.60	...	.60
Carbonate tech, bbls ....lb.	1.42¾	1.48	1.35	1.48	1:35	1.40
Hydrate, bbls ....lb.	1.66	1.76	1.66	1.76	1.66	1.76
Linoleate, paste, bbls ...lb.	...	.31¼	.30	.31¼	...	.30
Resinate, fused, bbls ...lb.	...	.13	.12½	.13	...	.12½
Precipitated, bbls ......lb.	...	.32	...	.32	...	.32
Oxide, black, bgs ......lb.	1.41	1.51	1.29	1.49	1.25	1.49
Cochineal, gray or bk bgs..lb.	.32	.36	.32	.36	.32	.39
Teneriffe silver, bgs ....lb.	.33	.37	.33	.37	.33	.40
Copper, metal, electrol 100 lb.	...	10.00	9.50	10.00	8.00	9.25
Carbonate, 400 lb bbls ..lb.	...	.08¼	...	.08¼	...	.08¼
52-54% bbls ....lb.	.14½	.16¼	.14½	.16¼	.14½	.16¼
Chloride, 250 lb bbls ...lb.	.17	.18	.17	.18	.17	.18
Cyanide, 100 lb drs ....lb.	.37	.38	.37	.38	.37	.38
Oleate, precip, bbls .....lb.	...	.20	...	.20	...	.20
Oxide, red, 100 lb bbls..lb.	.14	.15	.14	.15	.15	.17
black bbls, wks ......lb.	.15¼	.15¾	.14½	.15¾	.14	.16½
Resinate, precip, bbls ...lb.	.18	.19	.18	.19	.18	.19
Stearate, precip, bbls ...lb.	.35	.40	.35	.40	.35	.40
Sub-acetate verdigris, 400 lb bbls ....lb.	.18	.19	.18	.19	.18	.19
Sulfate, bbls, c-l, wks 100 lb.	...	4.15	3.85	4.15	...	3.85
Copperas, crys and sugar bulk c-l, wks, bgs ....ton	14.00	16.00	13.00	16.00	12.00	14.00
Corn Syrup, 42 deg, bbls 100 lb.	...	3.80	3.05	3.95	3.18	3.63
43 deg, bbls .....100 lb.	...	3.90	3.10	4.05	3.23	3.68
Corn Sugar, tanners, bbls 100 lb.	3.78	3.88	3.08	4.03	3.46	3.66
Cotton, Soluble, wet, 100 lb bbls ....lb.	.40	.42	.40	.42	.40	.42
Cream Tartar, USP, powd & gran, 300 lb bbls .....lb.	...	.16¼	.16¼	.16¾	.16¼	.17¼
Creosote, USP, 42 lb cbys lb.	.45	.47	.45	.47	.45	.47
Oil, Grade 1, tks ......gal.	.12½	.13½	.12½	.13½	.11½	.13½
Grade 2 ....gal.	.113	.12½	.109	.12	.10½	.12
Cresol, USP, drs ....lb.	.10	.10½	.10	.10½	.10	.11½
Crotonaldehyde, 98%, drs, wks ....lb.	.26	.30	.26	.30	.32	.36
Cudbear, English ....lb.	.19	.25	.19	.25	.19	.25
Cutch, Philippine, 100 lb bale lb.	.04	.04¾	.04	.04¾	.03½	.04¾
Cyanamid, bgs, c-l, frt allowed Ammonia unit	...	1.07½	...	1.07½	...	1.07½
Derris root 5% rotenone, bbls ....lb.	.39	.47	...	...	...	...
Dextrin, corn, 140 lb bgs f.o.b., Chicago ...100 lb.	4.35	4.55	3.45	5.00	3.60	4.15
British Gum, bgs ...100 lb.	4.60	4.80	3.70	5.40	3.85	4.50
White, 140 lb bgs ..100 lb.	4.30	4.50	3.40	4.95	3.50	4.10
Potato, Yellow, 220 lb bgs lb.	.07¾	.08¾	.07¾	.08¾	.07¾	.08¾
White, 220 lb bgs, lcl..lb.	.08	.09	.08	.09	.08	.09
Tapioca, 200 bgs, lcl ....lb.	...	.08	...	.08	.08	.08¾
Diamylamine, drs, wks ...lb.	...	.75	.75	1.00	...	1.00
Diamylene, drs, wks ......lb.	.095	.102	.095	.102	.095	.102
tks, wks ....lb.	...	.08½	...	.08½	...	.08½
Diamylether, wks, drs ....lb.	.085	.092	.085	.092	.085	.092
tks, wks ....lb.	...	.075	...	.075	...	.075
Oxalate, lcl, drs, wks...lb.	...	.30	...	...	...	...
Diamylphthalate, drs wks gal.	.19	.19½	.18	.19½	.18	.20½
Diamyl Sulfide, drs, wks ..lb.	..	1.10	...	1.10	...	1.10
Dianisidine, bbls ....lb.	2.25	2.45	2.25	2.45	2.25	2.45
Dibutyl Ether, drs, wks, lcl lb.	...	.22	...	...	...	...
Dibutylphthalate, drs, wks, frt allowed ....lb.	.19½	.20	.18	.21	.20	.23
Dibutyltartrate, 50 gal drs lb.	.35	.40	.35	.40	.35	.40
Dichlorethylene, drs .....gal.	.29	...	.29	...	.29	...
Dichloroethylether, 50 gal drs, wks ....lb.	.16	.17	.16	.17	.16	.17
tks, wks ....lb.	...	.15	...	.15	...	.15
Dichloromethane, drs, wks lb.	...	.23	...	.23	.15	.23
Dichloropentanes, drs, wks lb.	.032	.040	.032	.040	.032	.040
tks, wks ....lb.	...	.02½	...	.02½	...	.02½
Diethanolamine, tks, wks..lb.	..	.30	...	.30	...	...
Diethylamine, 400 lb drs ..lb.	2.75	3.00	2.75	3.00	2.75	3.00
Diethyl Carbinol, drs .....lb.	.60	.75	.60	.75	.60	.75
Diethylcarbonate, com drs lb.	.31⅜	.35	.31⅜	.35	.31⅜	.35
90% grade, drs ....lb.	...	.25	...	.25	...	.25
Diethylaniline, 850 lb drs..lb.	.52	.55	.52	.55	.52	.55
Diethylorthotoluidin, drs ..lb.	.64	.67	.64	.67	.64	.67
Diethyl phthalate, 1000 lb drs lb.	.18	.18½	.18	.19	.18½	.27
Diethylsulfate, tech, drs, wks, lcl ....lb.	...	.20	...	.20	...	...
Diethyleneglycol, drs .....lb.	.16½	.17½	.15½	.17½	.15½	.17½
Mono ethyl ethers, drs..lb.	.16	.17	.15	.17	.15	.17
tks, wks ....lb.	...	.15	...	.15	...	.15
Mono butyl ether, drs ..lb.	...	.26	...	.26	...	.26
Diethylene oxide, 50 gal drs, wks ....lb.	.20	.24	.20	.24	.20	.27
Diglycol Oleate, bbls .....lb.	...	.24	...	.24	.16	.24
Dimethylamine, 400 lb drs, pure 25 & 40% sol 100% basis ....lb.	...	.95	...	.95	...	.95
Dimethylaniline, 340 lb drs lb.	.29	.30	.29	.30	.29	.30
Dimethyl Ethyl Carbinol, drs lb.	.60	.75	.60	.75	.60	.75
Dimethyl phthalate, drs, wks, frt allowed ....lb.	.19½	.20	.19½	.21½	.20½	.24½
Dimethysulfate, 100 lb drs lb.	.45	.50	.45	.50	.45	.50
Dinitrobenzene, 400 lb bbls lb. *k*	.16	.19	.16	.19½	.17	.19½
Dinitrochlorobenzene, 400 lb bbls ....lb.	.14	.15½	.14	.15½	.14	.15½
Dinitronaphthalene, 350 lb bbls ....lb.	.34	.37	.34	.37	.34	.37
Dinitrophenol, 350 lb bbls lb.	.23	.24	.23	.24	.23	.24
Dinitrotoluene, 300 lb bbls lb.	.15½	.16½	.15½	.16½	.15½	.16½
Diphenyl ....lb.	.15	.25	.15	.25	.15	.25
Diphenylamine ....lb.	.31	.32	.31	.32	.31	.32
Diphenylguanidine, 100 lb bbl ....lb.	.35	.37	.35	.37	.36	.37

k Higher price is for purified material.

Prices

	Current Market		1936 Low	1936 High	1935 Low	1935 High
Dip Oil, see Tar Acid Oil.						
Divi Divi pods, bgs shipmt ....ton	32.00	35.00	32.00	45.00	36.00	40.00
Extract ....lb.	.05	.05½	.05	.05½	.05	.05½
Egg Yolk, dom., 200 lb cases ....lb.	...	.68	.63	.68	.46	.63
Imported ....lb.	.51	.53	.48	.56	...	...
Epsom Salt, tech, 300 lb bbls c-l NY ....100 lb.	1.80	2.00	1.80	2.00	1.80	2.25
USP, c-l, bbls ....100 lb.	...	2.00	...	2.00	2.00	2.25
Ether, USP anaesthesia 55 lb drs ....lb.	.22	.23	.22	.23	.22	.23
(Conc) ....lb.	.09	.10	.09	.10	.09	.10
Ether, Isopropyl 50 gal drs lb.	.07	.08	.07	.08	.07	.08
tks, frt allowed ....lb.	...	.06	...	.06	...	.06
Nitrous, conc, bottles ....lb.	.75	.77	.75	.77	.75	.77
Synthetic, wks, drs ....lb.	.08	.09	.08	.09	.08	.09
Ethyl Acetate, 85% Ester						
tks, frt alld ....lb.	...	.06½	.06½	.08	.07½	.08
drs, frt alld ....lb.	...	.07½	.07½	.09	.08½	.09
Anhydrous, tks, frt alld..lb.	...	.07½	.07	.08½	...	.08½
drs, frt alld ....lb.	...	.08½	.08	.10	.09½	.10
Acetoacetate, 110 gal drs lb.	...	.37	.37	.68	.65	.68
Benzylaniline, 300 lb drs lb.	.88	.90	.88	.90	.88	.90
Bromide, tech, drs ....lb.	.50	.55	.50	.55	.50	.55
Chloride, 200 lb drs ....lb.	.22	.24	.22	.24	.22	.24
Chlorocarbonate cbys ....lb.	...	.30	...	.30	...	.30
Crotonate, drs ....lb.	1.00	1.25	1.00	1.25	1.00	1.25
Ether, Absolute, 50 gal drs ....lb.	.50	.52	.50	.52	.50	.52
Lactate, drs, wks ....lb.	.25	.29	.25	.29	.25	.29
Methyl Ketone, 50 gal drs, frt allowed ....lb.	.07½	.08	.07½	.09	.08½	.09
tks, frt allowed ....lb.	...	.06½	.06½	.07½	...	.07½
Oxalate, drs, wks ....lb.	.37½	.55	.37½	.55	.37½	.55
Oxybutyrate, 50 gal drs, wks ....lb.	.30	.30½	.30	.30½	.30	.30½
Ethylene Dibromide, 60 lb drs ....lb.	.65	.70	.65	.70	.65	.70
Chlorhydrin, 40%, 10 gal cbys chloro, cont ....lb.	.75	.85	.75	.85	.75	.85
Anhydrous ....lb.	...	.75	...	.75	...	...
Dichloride, 50 gal drs, wks ....lb.	.0545	.0994	.0545	.0994	.0545	.0994
Glycol, 50 gal drs, wks lb.	.17	.21	.17	.21	.17	.28
tks, wks ....lb.	...	.16	...	.16	...	...
Mono Butyl Ether, drs. wks ....lb.	.20	.21	.20	.21	.20	.21
tks, wks ....lb.	...	.19	...	.19	...	.19
Mono Ethyl Ether, drs, wks ....lb.	.16	.17	.16	.17	.16	.17
tks, wks ....lb.	...	.15	...	.15	...	.15
Mono Ethyl Ether Acetate, drs, wks ....lb.	...	.14	.14	.18½	.17½	.18½
tks, wks ....lb.	...	.13	.13	.16½	...	.16½
Mono, Methyl Ether, drs wks ....lb.	.19	.23	.19	.23	.19	.23
tks, wks ....lb.	...	.18	...	.18	...	...
Stearate	.18	.18	.18	.18	.18	.18
Oxide, cyl ....lb.	.50	.55	.50	.60	.55	.75
Ethylidenaniline ....lb.	.45	.47½	.45	.47½	.45	.47½
Feldspar, blk pottery ....ton	...	14.50	...	14.50	...	14.50
Powd, blk, wks ....ton	14.00	14.50	14.00	14.50	14.00	14.50
Ferric Chloride, tech, crys, 475 lb bbls ....lb.	.05	.07½	.05	.07½	.05	.07½
sol, 42° cbys ....lb.	.06¼	.06½	.06¼	.06½	.06¼	.06½
Fish Scrap, dried, unground, wks ....unit *l*	...	3.50	2.50	3.50	2.25	2.90
Acid, Bulk, 6 & 3%, delv Norfolk & Baltimore basis ....unit *m*	31.00	nom.	...	2.25	2.00	2.35
Fluorspar, 98%, bgs ....lb.	30.00	35.50	30.00	35.50	28.00	35.50
Formaldehyde, USP, 400 lb bbls, wks ....lb.	.05¾	.06¼	.05¾	.07	.06	.07
Fossil Flour ....lb.	.02½	.04	.02½	.04	.02½	.04
Fullers Earth, blk, mines ....ton	6.50	15.00	6.50	15.00	6.50	15.00
Imp powd, c-l, bgs ....ton	23.00	30.00	23.00	30.00	23.00	30.00
Furfural (tech) drs, wks..lb.	.10	.15	.10	.15	.10	.15
Furfuramide (tech) 100 lb drs ....lb.	...	.30	...	.30	...	.30
Fusel Oil, 10% impurities lb.	.16	.18	.16	.18	.16	.18
Fustic, chips ....lb.	.04	.05	.04	.05	.04	.05
Crystals, 100 lb boxes...lb.	.20	.23	.20	.23	.20	.23
Liquid 50°, 600 lb bbls..lb.	.08½	.12	.08½	.12	.08½	.12
Solid, 50 lb boxes........lb.	.16	.18	.16	.18	.16	.18
Sticks ....ton	25.00	26.00	25.00	26.00	25.00	26.00
G Salt paste, 360 lb bbls...lb.	.45	.47	.45	.47	.42	.43
Gall Extract ....lb.	.18	.20	.18	.20	.18	.20
Gambier, com 200 lb bgs..lb.	...	.06	...	.06	.05	.08
Singapore cubes, 150 lb bgs ....100 lb.	.08	.09	.08	.09	.07⅛	.09⅛
Gelatin, tech, 100 lb cs ...lb.	.50	.55	.50	.55	.50	.55
Glauber's Salt, tech, c-l, bgs, wks* ....100 lb.	.95	1.15	.95	1.30	1.10	1.30
Anhydrous, see Sodium Sulfate.						
Glue, bone, com grades, c-l bgs ....lb.	.10½	.17½	.10½	.17½	...	...
Better grades, c-l, bgs lb.	.12	.17½	.12	.17½	...	...
Casein, kgs ....lb.	.18	.22	.18	.22	.18	.22
Glycerin, CP, 550 lb drs ..lb.	...	.21½	.16	.21½	.14	.14½
Dynamite, 100 lb drs ...lb.	...	.21½	.13¾	.21½	.13¾	.14½
Saponification, drs ....lb.	...	.22	.10¼	.22	.10	.11½
Soap Lye, drs ....lb.	...	.20	.09¼	.20	.09	.10

l + 10; *m* + 50; * Bbls. are 20c higher.

Current

Glyceryl Phthalate
Gum, Hemlock

	Current Market		1936 Low	1936 High	1935 Low	1935 High
Glyceryl Phthalate ....lb.	...	.29	.28	.29	...	.28
Glyceryl Stearate, bbls....lb.	...	.18		.18	...	.18
Glycol Phthalate ....lb.	...	.29	.29	.35	.28	.29
Glycol Stearate ....lb.	...	.23	..	.23	.18	.23
Graphite:						
Crystalline, 500 lb bbls..lb.	...	.06¼	.04	.06¼	.04	.05
Flake, 500 lb. bbls .....lb.	...	.06	.06¼	.08	.08	.16
Amorphous, bbls ....lb.	.03½	.04½	.03	.04½	.03	.04
GUMS						
Gum Aloes, Barbadoes ....lb.	.85	.90	.85	.90	.85	.90
Arabic, amber sorts ....lb.	.09¾	.10	.09	.10¾	.09½	.15
White sorts, No. 1, bgs..lb.	.27	.28	.25	.28	.21	.27
No. 2, bgs ....lb.	.25	.26	.24	.26	.19	.26
Powd, bbls ....lb.	.13	.14	.13	.14	.13¼	.18
Asphaltum, Barbadoes (Manjak) 200 lb bgs, f.o.b., NY ....lb.	.02½	.10½	.02½	.10½	.02½	.10½
Egyptian, 200 lb cases, f.o.b., NY ....lb.	.12	.15	.12	.15	.12	.15
California, f.o.b., NY, drs ....ton	29.00	55.00	29.00	55.00	29.00	55.00
Benzoin Sumatra, USP, 120 lb cases ....lb.	.16	.17	.15	.19	.19	.28
Copal, Congo, 112 lb bgs, clean, opaque ....lb.	...	.19½	.18½	.20	.19½	.24⅝
Dark amber ....lb.	...	.06⅞	.06⅞	.08	.07¼	.09¼
Light amber ....lb.	...	.10¼	.10¼	.14⅛	.11½	.14⅞
Copal, East India, 180 lb bgs						
Macassar pale bold ....lb.	.12⅝	.13¼	.12⅝	.14	.09½	.10¾
Chips ....lb.	...	.06½	.06⅛	.06½	.05½	.06
Nubs ....lb.	...	.10⅜	.10⅜	.11⅛	...	...
Dust ....lb.	.03⅝	.04⅛	.03⅝	.04⅛	.03⅝	.04½
Singapore						
Bold ....lb.	...	.15½	.15⅛	.16⅞	.12⅛	.17
Chips ....lb.	...	.04⅜	.04⅜	.05¼	.04⅝	.05⅝
Nubs ....lb.	...	.10	.10	.11¼	.10	.11¾
Dust ....lb.	.03⅝	.04⅛	.03⅝	.04⅛	.03⅝	.05½
Copal Manilla, 180-190 lb baskets, Loba A .....lb.	...	.09¼	.09¼	.13	.11¾	.13
Loba B ....lb.	...	.08⅞	.08⅞	.12	.10¼	.12
Loba C ....lb.	...	.08⅜	.08⅜	.11⅛	.10⅛	.11½
MA sorts ....lb.	...	.06¾	.06¾	.07⅝	.06	.07⅝
DBB ....lb.	...	.07⅝	.07⅝	.08⅞	.08	.09
Dust ....lb.	...	.05	.05	.06⅛	.04⅞	.06⅛
Copal Pontianak, 224 lb cases, bold genuine ....lb.	...	.14½	.14¼	.16	.14⅜	.16⅝
Mixed ....lb.	.13¼	.13¼	.13¼	.13¾	.12⅞	.14⅞
Chips ....lb.	...	.08½	.07	.08½	.06⅞	.08¼
Nubs ....lb.	...	.11½	.10¼	.11½	.09⅝	.11¾
Split ....lb.	...	.12¾	.12⅞	.13	.12⅜	.13⅞
Dammar Batavia, 136 lb cases						
A ....lb.	.21¾	.22¼	.21⅜	.22¼	.19	.21⅞
B ....lb.	.20¼	.21½	.20⅜	.21½	.18	.20⅞
C ....lb.	...	.16⅝	.16½	.17⅝	.16	.17
D ....lb.	...	.13⅞	.13⅝	.14⅜	.11¾	.14⅛
A/D ....lb.	...	.16¼	.15½	.17	.14	.16
A/E ....lb.	...	.12⅞	.12⅞	.14¼	.11¾	.13¾
E ....lb.	.06¾	.07¼	.06¾	.07¼	.07	.07¼
F ....lb.	...	.05⅞	.05⅞	.06⅞	.06⅛	.06⅞
Singapore						
No. 1 ....lb.	.16¼	.16⅞	.16¼	.17½	.15⅝	.19
No. 2 ....lb.	...	.13	.13	.14¼	.10⅝	.14⅞
No. 3 ....lb.	.05¼	.05¾	.05¼	.05¾	.04⅝	.05⅞
Chips ....lb.	...	.09¾	.09¾	.09¾	.08⅞	.09¾
Dust ....lb.	...	.04¾	.04¼	.05⅝	.04¾	.05⅞
Seeds ....lb.	...	.07⅜	.06⅝	.07⅜	.04¾	.07¼
Elemi, cons ....lb.	.09¾	.10¼	.09¾	.10¼	...	...
Ester ....lb.	.08¼	.08¾	.07⅝	.08¾	.07¼	.08⅜
Gamboge, pipe, cases .....lb.	.58	.59	.58	.59	.55	.65
Powd, bbls ....lb.	.65	.66	.65	.66	.65	.75
Ghatti, sol. bgs ....lb.	.11	.15	.11	.15	.09	.15
Karaya, powd, bbls, xxx..lb.	.24	.25	.24	.25	.23	.25
xx ....lb.	.16	.17	.16	.17	.15	.17
No. 1 ....lb.	.09½	.10	.09½	.10	.08	.10
No. 2 ....lb.	.08½	.09	.08½	.09	.07	.09
Kauri, NY, San Francisco, Brown XXX, cases ....lb.	.60	.60½	.60	.60½	.60	.60½
BX ....lb.	.33	.33½	.33	.33½	.33	.33½
B1 ....lb.	...	.21	.19	.21	.19	.19½
B2 ....lb.	...	.15½	.14½	.15½	.14½	.15
B3 ....lb.	.12	.12½	.12	.12½	.12	.12½
Pale XXX ....lb.	.65	.65½	.65	.65½	.65	.65½
No. 1 ....lb.	.40	.40½	.40	.40½	.40	.40½
No. 2 ....lb.	.22	.22½	.22	.22½	.22	.22½
No. 3 ....lb.	.15	.15½	.15	.15½	.15	.15½
Kino, tins ....lb.	.70	.80	.70	.80	.70	.80
Mastic ....lb.	.57	.58	.56	.60½	.46	.60½
Sandarac, prime quality, 200 lb bgs & 300 lb cks ...lb.	.35	.38	.19½	.38	.26¼	.35½
Senegal, picked bgs ....lb.	.20	.21	.20	.21	.20	.21
Sorts ....lb.	.09¾	.10¼	.09¾	.12½	.09⅜	.12½
Thus, bbls ....280 lbs.	...	11.50	11.00	11.50	10.50	11.00
Strained ....280 lbs.	...	11.50	11.00	11.50	10.50	11.00
Tragacanth, No. 1, cases..lb.	2.25	2.50	1.20	2.50	1.15	1.30
No. 2 ....lb.	1.85	1.90	1.10	1.90	1.05	1.20
No. 3 ....lb.	1.80	1.85	.95	1.85	.95	1.05
No. 4 ....lb.	1.70	1.75	.85	1.75	.85	.95
No. 5 ....lb.	1.50	1.55	.75	1.55	.75	.85
No. 6, bgs ....lb.	.30	.31	.18	.31	.14	.19
Sorts, bgs ....lb.	.30	.35	.25	.30	.11	.25
Yacca, bgs ....lb.	.03¼	.03¾	.03¼	.03¾	.03¼	.03¾
Helium, cyl (200 cu. ft.) cyl.	...	25.00	...	25.00	...	25.00
Hematite crystals, 400 lb bbls lb.	.16	.18	.16	.18	.16	.18
Paste, 500 bbls ....lb.	...	.11	...	.11	...	.11
Hemlock, 25%, 600 lb bbls, wks ....lb.	...	.02⅞	...	.02⅞	...	.02⅞
tks ....lb.	...	.02½	...	.02½	...	.02½

	Current Market		1936 Low	1936 High	1935 Low	1935 High
Hexalene, 50 gal drs, wks lb.	...	.30	...	.30	...	.30
Hexane, normal 60-70°C.						
Group 3, tks .... gal.	...	.12	...	.12	...	.14
Hexamethylenetetramine,						
powd, drs .... lb.	.35	.36	.35	.39	.37	.39
Hexyl Acetate, delv, drs .. lb.	.12	.12½	.12	.12½	.12	.12½
tks .... lb.	...	.11½	...	.11½	...	.11½
Hoof Meal, f.o.b. Chicago unit	...	2.85	2.35	3.00	2.50	2.70
Hydrogen Peroxide, 100 vol,						
140 lb cbys .... lb.	.20	.21	.20	.21	.20	.21
Hydroxyamine Hydrochloride						
.... lb.	...	3.15	...	3.15	...	3.15
Hypernic, 51°, 600 lb bbls lb.	.17	.20	.17	.20	.17	.20
Indigo, Madras, bbls ..... lb.	1.25	1.30	1.25	1.30	1.25	1.30
20% paste, drs .... lb.	.15	.18	.15	.18	.15	.18
Synthetic, liquid .... lb.	.13	.14	.13	.14	...	.12
Iodine, Resublimed, kgs... lb.	1.50	1.55	1.50	1.75	...	1.90
Irish Moss, ord, bales .... lb.	.09	.10	.09	.10	.09	.10
Bleached, prime, bales .. lb.	.18	.19	.18	.19	.18	.19
Iron Acetate Liq. 17°, bbls lb.	.03	.04	.03	.04	.03	.04
Chloride see Ferric Chloride.						
Nitrate, coml, bbls .. 100 lb.	2.75	3.25	2.75	3.25	2.75	3.25
Oxide, English .... lb.	.07½	08¾	.07½	.08¾	.07½	.08¾
Isobutyl Carbinol (128-132°C)						
drs, wks .... lb.	.33	.34	.33	.34	.33	.34
tks, wks .... lb.	...	.32	...	.32	...	.32
Isopropyl Acetate, tks, frt						
allowed .... lb.	...	.06½	.06	.07½	...	.07½
drs, frt allowed .... lb.	.07½	.08	.07	.09	.08½	.09
Ether, see Ether, isopropyl.						
Keiselguhr, 95 lb bgs, NY,						
Brown .... ton	60.00	70.00	60.00	70.00	60.00	70.00
Lead Acetate, brown, broken,						
f.o.b. NY, bbls ...... lb.	...	.10	.09½	.10	...	.09½
White, broken, bbls .. lb.	...	.11	.	.11	...	.11
cryst, bbls .... lb.	...	.11	.10½	.11	...	.10½
gran, bbls .... lb.	...	.11¾	.11	.11¾	...	.11
powd, bbls .... lb.	...	.11¾	.11¼	.11¾	...	.11¼
Arsenate, East, jobbers,						
drs .... lb.	.09	.09⅜	.09	.09⅜	.09	.09½
Dealers, drs .... lb.	.09¼	.10¾	.09¼	.10¾	.09¼	.10¾
West, jobbers, drs .. lb.	...	.09	...	.09	...	.09
Dealers, drs ..... lb.	...	.10	...	.10	...	.10
Linoleate, solid, bbls ... lb.	...	.18	.18	.26½	.26	.26½
Metal, c-l, NY ..... 100 lb.	...	4.85	4.50	4.85	3.50	4.50
Red, dry, 95% Pb_3O_4,						
delv .... lb.	.0770	.08	.07	.08	.06	.08
97% Pb_3O_4, delv ..... lb.	.0795	.08¾	.07¼	.08¾	.06¼	.08¼
98% Pb_3O_4, delv ..... lb.	.0820	.09	.07½	.09	.06½	.08½
Nitrate, 500 lb bbls, wks lb.	.09	.09½	.09	.09½	.10	.14
Oleate, bbls .... lb.	.15	.16	.15	.16	.15	.16
Resinate, precip, bbls ... lb.	...	.14	...	.14	...	.14
Stearate, bbls .... lb.	.22	.23	.22	.23	.22	.23
Titanate, bbls, c-l, f.o.b.						
wks, frt allowed...... lb.	...	.10	...	...	...	...
White, 500 lb bbls, wks.. lb.	.06¾	.07	.06½	.07	.06½	.07
Sulfate, 500 lb bbls, wks lb.	...	.06	...	.06	...	.06
Lime, chemical quicklime,						
f.o.b., wks, bulk ..... ton	7.00	7.25	7.00	7.25	7.00	7.25
Hydrated, f.o.b., wks .. ton	9.00	12.00	8.50	12.00	8.50	12.00
Lime Salts, see Calcium Salts.						
Lime sulfur, dealers, tks.. gal.	...	.11	...	.11	.10½	.11
drs .... gal.	.13	.16	.13	.16	.13	.16½
Dry, bgs, jobbers....... lb.	.07¼	.10¼	.07¼	.10¼	...	...
Linseed Meal, bgs .... ton	...	40.00	29.00	40.50	25.50	40.00
Litharge, coml, delv, bbls.. lb.	.0670	.07	.06	.07	.05	.07
Lithopone, dom, ordinary,						
delv, bgs .... lb.	.04¼	.04½	.04¼	.04¾	.04½	.04¾
bbls .... lb.	.04½	.04¾	.04½	.05	.04¾	.05
High strength, bgs ..... lb.	.05¾	.06	.05¾	.06¼	.06	.06¼
bbls .... lb.	.06	.06¼	.06	.06½	.06¼	.06½
Titanated, bgs .... lb.	.05¾	.06	.05¾	.06¼	.06	.06¼
bbls .... lb.	.06	.06¼	.06	.06½	.06¼	.06½
Logwood, 51°, 600 lb bbls lb.	.06½	.10¼	.06½	.10½	.08½	.10½
Solid, 50 lb boxes .... lb.	.13½	.17½	.13½	.17½	.13½	.17½
Sticks .... ton	24.00	26.00	24.00	26.00	24.00	26.00
Madder, Dutch .... lb.	.22	.25	.22	.25	.22	.25
Magnesite, calc, 500 lb bbl ton	60.00	65.00	60.00	65.00	60.00	65.00
Magnesium Carb, tech, 70 lb						
bgs, wks .... lb.	.06	.06½	.06	.06½	.06	.06½
Chloride flake, 375 lb drs,						
c-l, wks .... ton	36.00	39.00	36.00	39.00	36.00	39.00
Magnesium fluosilicate, crys,						
400 lb bbls, wks ..... lb.	.10	.10½	.10	.10½	.10	.10½
Oxide, USP, light, 100 lb						
bbls .... lb.	...	.42	...	.42	...	.42
Heavy, 250 lb bbls .. lb.	...	.50	...	.50	...	.50
Palmitate, bbls .... lb.	.23	.24	.23	.24	.22	.24
Stearate, bbls .... lb.	.21	.24	.20	.24	.19	.22
Linoleate, liq drs ...... lb.	.18	.19	.18	.19	.18	.19
Resinate, fused, bbls ... lb.	.08¼	.08½	.08¼	.08½	.08¼	.08½
precip, bbls .... lb.	...	.12	...	.12	...	.12
Manganese Borate, 30%, 200						
lb bbls .... lb.	.15	.16	.15	.16	.15	.16
Chloride, 600 lb cks .... lb.	.09	.12	.09	.12	.09	.12
Dioxide, tech (peroxide),						
paper bgs, c-l .... ton	...	47.50	...	47.50	45.00	50.00
Sulfate, tech, anhyd, 90-						
95%, 550 lb drs...... lb.	...	.07¼	...	...	...	...
Mangrove, 55%. 400 lb bbls lb.	...	.04	...	.04	...	.04
Bark. African .... ton	...	25.50	25.50	27.00	26.00	30.00
Mannitol, pure cryst, cs,						
wks .... lb.	...	1.48	1.48	1.60	...	...
Marble Flour, blk .... ton	12.00	13.00	12.00	13.00	12.00	13.00
Mercuric chloride .... lb.	...	1.14	.81	1.14	.71	.93
Mercury metal ... 76 lb. flasks	93.00	95.00	73.50	95.00	69.00	77.00
Meta-nitro-aniline .... lb.	.67	.69	.67	.69	.67	.69
Meta-nitro-paratoluidine 200						
lb bbls .... lb.	1.40	1.55	1.40	1.55	1.40	1.55

Current

Meta-phenylene-diamine
Orthodichlorobenzene

	Current Market		1936 Low	1936 High	1935 Low	1935 High
Meta-phenylene-diamine 300 lb bbls ... lb.	.80	.84	.80	.84	.80	.84
Peroxide, 100 lb cs ... lb.	1.20	1.25	1.20	1.25	1.20	1.25
Silicofluoride, bbls ... lb.	.09	.10	.09	.10	.09	.10
Stearate, bbls ... lb.	.19	.20	.19	.20	.19	.20
Meta-toluene-diamine, 300 lb bbls ... lb.	.67	.69	.67	.69	.67	.69
Methanol, 95%, frt allowed, drs ... gal. *o*	.37½	.58	.37½	.58	.37½	.58
tks, frt allowed ... gal. *o*	.33	.36½	.33	.36½	.33	.36½
97% frt allowed, drs gal. *o*	.38½	.59	.38½	.59	.38½	.59
tks, frt allowed ... gal. *o*	.34	.37½	.34	.37½	.34	.37½
Pure, frt allowed, drs gal. *o*	.40	.61	.40	.61	.40	.61
tks, frt allowed ... gal. *o*	.35½	.39	.35½	.39	.35½	.39
Synthetic, frt allowed, drs ... gal. *o*	.40	.61	.40	.61	.40	.61
tks, frt allowed ... gal. *o*	.35½	.39	.35½	.39	.35½	.39
Methyl Acetate, dom, 98-100%, drs ... lb.	.16	.17½	.11	.18½	.18	.18½
Synthetic, 410 lb drs ... lb.	.16	.17	.16	.17	.16	.17
tks ... lb.	...	.15	...	.15	...	.15
Acetone, frt allowed, drs ... gal. *p*	.45½	.58½	.45½	.68½	.49½	.73½
tks, frt allowed, drs gal. *p*	.41	.44½	.41	.48	.44	.52½
Synthetic, frt allowed, east of Rocky M., drs gal. *p*	.52½	.59½	.52½	.60	.57½	.60
tks, frt allowed ... gal.	.48	.49½	.48	.53	...	.53
West of Rocky M., frt allowed, drs ... gal. *p*	.55½	.58	.55½	.69	.66	.69
tks, frt allowed ... gal. *p*	...	.51	.51	.63½	...	.63½
Hexyl Ketone, pure, drs lb.	...	.60	...	.60	...	.60
Anthraquinone ... lb.	.65	.67	.65	.67	.65	.67
Butyl Ketone, tks ... lb.	...	.10½	...	.10½	...	.10½
Chloride, 90 lb cyl ... lb.	...	.45	...	.45	...	.45
Ethyl Ketone, tks ... lb.	...	.07½	...	.07½	...	.07½
Propyl carbinol, drs ... lb.	.60	.75	.60	.75	.60	.75
Mica, dry grd, bgs, wks ... lb.	35.00	...	35.00	...	35.00	...
Michler's Ketone, kgs ... lb.	...	2.50	...	2.50	...	2.50
Molasses, blackstrap, tks, f.o.b. NY ... gal.	...	.07¼	.07	.08¼	.07¾	.08¼
Monoamylamine, drs, wks lb.	...	1.00	...	1.00	...	1.00
Monochlorobenzene, see Chlorobenzene, mono.						
Monoethanolamine, tks, wks lb.	...	.30	...	.30	...	...
Monomethylparaminosulfate, 100 lb drs ... lb.	3.75	4.00	3.75	4.00	3.75	4.00
Myrobalans 25%, liq bbls ... lb.	...	.04¼	...	.04¼	...	.04¼
50% Solid, 50 lb boxes lb.	.06	.06¼	.06	.06¼	.06	.06¼
J1 bgs ... ton	...	22.00	22.00	24.00	23.50	27.00
J2 bgs ... ton	...	14.25	14.25	15.00	15.00	15.75
R2 bgs ... ton	...	14.00	14.00	14.50	16.00	16.50
Naphtha, v.m.&p. (deodorized) see petroleum solvents.						
Naphtha, Solvent, water-white, tks ... gal.	...	.31	...	.31	.26	.30
drs, c-l ... gal.	...	.36	...	.36	.31	.35
Naphthalene, dom, crude, bgs, wks ... lb.	...	2.75	2.75	4.50	1.65	3.00
Imported, cif, bgs ... lb.	...	nom.	...	...	1.90	3.00
Dyestuffs, bgs, bbls, Eastern wks ... lb.	.06	.07	.06	.07	.04¼	.07
Balls, flakes, pks ... lb.	...	.08	.07¼	.08	...	..
Balls, ref'd, bbls, Eastern wks ... lb.	...	.07¼	.06¾	.07¼	.04½	.06¾
Flakes, ref'd, bbls, Eastern wks ... lb.	...	.07¼	.06¾	.07¼	.04½	.06¾
Dyestuffs, bgs, bbls, Mid-West wks ... lb. *q*	.06½	.07½	.06½	.07½	.04¾	.07½
Balls, ref'd, bbls, Mid-West wks ... lb. *q*	...	.07¾	.07¼	.07¾	.05	.07½
Flakes, ref'd, bbls, Mid-West wks ... lb. *q*	...	.07¾	.07¼	.07¾	.05	.07¼
Nickel Carbonate, bbls ... lb.	...	.36	...	.36	.35	.36
Chloride, bbls ... lb.	.18	.19	.18	.19	.18	.19
Oxide, 100 lb kgs, NY ... lb.	.35	.37	.35	.37	.35	.37
Salt, 400 lb bbls, NY ... lb.	.13	.13½	.13	.13½	.12½	.13½
Single, 400 lb bbls, NY lb.	.13	.13½	.13	.13½	.11½	.13½
Metal ingot ... lb.	...	.35	...	.35	...	.35
Nicotine, free 50%, 8 lb tins, cases ... lb.	8.25	10.15	8.25	10.15	8.25	10.15
Sulfate, 55 lb drs ... lb.	.75	1.17	.75	1.17	.67	.80
Nitre Cake, blk ... ton	12.00	14.00	12.00	14.00	12.00	14.00
Nitrobenzene, redistilled, 1000 lb drs, wks ... lb.	.08	.10	.08	.11	.09	.11
tks ... lb.	...	.08½	.	.08½	...	.08½
Nitrocellulose, c-l-l c-l, wks lb.	.26	.29	.26	.34	.27	.34
Nitrogenous Mat'l, bgs, imp unit	...	3.10	2.00	3.10	2.20	2.75
dom, Eastern wks ... unit	...	3.00	1.90	3.00	2.20	2.40
dom, Western wks ... unit	...	2.75	1.85	2.75	1.90	2.30
Nitronaphthalene, 550 lb bbls lb.	.24	.25	.24	.25	.24	.25
Nutgalls Aleppy, bgs ... lb.	.16	.18	.16	.18	.12	.18
Chinese, bgs ... lb.	.19	.20	.19	.20	.19	.20
Oak Bark Extract, 25%, bbls lb.	...	.03½	...	.03½	...	.03½
tks ... lb.	...	.02¾	...	.02¾	...	.02¾
Octyl Acetate, tks, wks ... lb.	...	.15	...	.15	...	...
Orange-Mineral, 1100 lb cks NY ... lb.	...	.10¾	.10	.10¾	.09¼	.10½
Orthoaminophenol, 50 lb kgs. lb.	2.15	2.25	2.15	2.25	2.15	2.25
Orthoanisidine, 100 lb drs lb.	.82	.84	.82	.84	.82	.84
Orthochlorophenol, drs ... lb.	.50	.65	.50	.65	.50	.65
Orthocresol, drs ... lb.	.13	.15	.13	.15	.13	.15
Orthodichlorobenzene, 1000 lb drs ... lb.	.06½	.11½	.05½	.11½	.05½	.06

o Country is divided in 5 zones, prices varying by zone. In drum prices range covers both zone and c-l and lcl quantities in the 5 zones; in each case, bbl. prices are 2½c higher; synthetic is not shipped in bbls.; *p* Country is divided into 5 zones. Also see footnote directly above; *q* Naphthalene quoted on Pacific Coast F.A.S. Phila. or N. Y.

	Current Market		1936 Low	1936 High	1935 Low	1935 High
Orthonitrochlorobenzene, 1200 lb drs, wks ....lb.	.28	.29	.28	.29	.28	.29
Orthonitrotoluene, 1000 lb drs, wks ....lb.	.07	.10	.07	.10	.05½	.10
Orthonitrophenol, 350 lb drs ....lb.	.52	.80	.52	.80	.52	.80
Orthotoluidine, 350 lb bbls, l-c-l ....lb.	.14½	.15	.14½	.15	.14½	.15
Orthonitroparachlorphenol, tins ....lb.	.70	.75	.70	.75	.70	.75
Osage Orange, cryst .....lb.	.17	.25	.17	.25	.17	.25
51 deg liquid ....lb.	.07	.07¾	.07	.07¾	.07	.07¾
Powd, 100 lb bgs ......lb.	.14½	.15	.14½	.15	.14½	.15
Paraffin, rfd, 200 lb cs slabs						
122-127 deg M P ......lb.	.0445	.04½	.0445	.04½	.04	.04¾
128-132 deg M P ......lb.	.04¾	.049	.04¾	.049	.05	.0515
133-137 deg M P ......lb.	.05½	.05¾	.05½	.05¾	.0575	.06
Para aldehyde, 110-55 gal drs ....lb.	.16	.18	.16	.18	.16	.18
Aminoacetanilid, 100 lb kgs ....lb.	...	.85	...	.85	...	.85
Aminohydrochloride, 100 lb kgs ....lb.	1.25	1.30	1.25	1.30	1.25	1.30
Aminophenol, 100 lb kgs lb.	...	1.05	...	1.05	...	1.05
Chlorophenol, drs ......lb.	.50	.65	.50	.65	.50	.65
Coumarone, 330 lb drs ..lb.	...	...	...	...	...	...
Cymene, refd, 110 gal dr ....gal.	2.25	2.50	2.25	2.50	2.25	2.50
Dichlorobenzene, 200 lb bbls wks ....lb.	.16	.20	.16	.20	.16	.20
Formaldehyde, bbls, wks lb.	.34	.35	.34	.39	.38	.39
Nitroacetanilid, 300 lb bbls ....lb.	.45	.52	.45	.52	.45	.52
Nitroaniline, 300 lb bbls, wks ....lb.	.47	.51	.47	.51	.48	.55
Nitrochlorobenzene, 1200 lb drs, wks ....lb.	.23½	.24	.23½	.24	.23½	.24
Nitro-orthotoluidine, 300 lb bbls ....lb.	2.75	2.85	2.75	2.85	2.75	2.85
Nitrophenol, 185 lb bbls lb.	.45	.50	.45	.50	.45	.50
Nitrosodimethylaniline, 120 lb bbls ....lb.	.92	.94	.92	.94	.92	.94
Nitrotoluene, 350 lb bbls lb.	.36	.37	.36	.37	.35	.37
Phenylenedamine, 350 lb bbls ....lb.	1.25	1.30	1.25	1.30	1.25	1.30
Para Tertiary amyl phenol, wks, drs, c-l ....lb.	...	.26	.26	.50	.32	.50
Toluenesulfonamide, 175 lb bbls ....lb.	.70	.75	.70	.75	.70	.75
tks, wks ....lb.	...	.31	...	.31	...	.31
Toluenesulfonchloride, 410 lb bbls, wks ....lb.	.20	.22	.20	.22	.20	.22
Toluidine, 350 lb bbls, wks ....lb.	.58	.60	.58	.60	.56	.60
Paris Green, Arsenic Basis						
100 lb kgs ....lb.	...	.24	...	.24	...	.24
250 lb kgs ....lb.	...	.22	...	.22	...	.22
Perchlorethylene, 100 lb drs, frt allowed ....lb.	...	.10½	.10½	.15	...	.15
Persian Berry Ext, bbls ..lb.	.55	Nom.	.55	Nom.	.55	Nom.
Pentane, normal, 28-38°C, group 3, tks.........gal.	...	.09	...	.09	...	.09
drs, group 3 ....gal.	.10	.15	.10	.15	.10	.15
Petrolatum, dark amber, bbls ....lb.	.02⅝	.02⅞	.02⅝	.02⅞	.02	.02⅞
Light, bbls ....lb.	.03⅛	.03⅜	.03⅛	.03⅜	.02½	.03⅜
Medium, bbls ....lb.	.02⅞	.03⅛	.02⅞	.03⅛	.02¼	.03⅛
Dark green, bbls ....lb.	.02½	.02¾	.02½	.02¾	.02½	.02¾
White, lily, bbls ....lb.	.06	.06¼	.06	.06¼	.05¼	.06½
White, snow, bbls ......lb.	.07	.07¼	.07	.07¼	.06⅛	.07½
Red, bbls ....lb.	.02⅝	.02⅞	.02⅝	.02⅞	.02¼	.02⅞
Petroleum Ether, 30-60°, group 3, tks ....gal.	...	.13	...	.13	...	.13
drs, group 3 ....gal.	.15	.16	.15	.16	.15	.16

PETROLEUM SOLVENTS AND DILUENTS

	Current Market		1936 Low	1936 High	1935 Low	1935 High
Cleaners naphthas, group 3, tks, wks ....gal.	.07⅜	.07½	.07⅜	.07½	.06⅞	.07¼
Bayonne, tks, wks ..gal.	...	.09½	.09	.09½	...	.09
West Coast, tks ....gal.	...	.15	...	.15	...	.15
Hydrogenated, naphthas, frt allowed East, tks ....gal.	...	.16	.15	.16	.15	.17½
No. 2, tks ....gal.	...	.18	...	.18	.18	.22½
No. 3, tks ....gal.	...	.15	...	.15	.15	.17½
No. 4, tks ....gal.	...	.18	...	.18	.18	.22½
Lacquer diluents, tks						
Bayonne ....gal.	.12	.12½	.12	.12½	.12	.12½
Group 3, tks ....gal.	.07⅞	.08½	.07⅞	.08½	.07⅞	.08
Naphtha, V.M.P., East, tks, wks ....gal.	...	.10	.09	.10	...	.09
Group 3, tks, wks ...gal.	.07⅜	.07½	.07⅜	.07½	.06⅞	.07¼
Petroleum thinner, East, tks, wks ....gal.	...	.09	.09	.09½	...	.09
Group 3, tks, wks ...gal.	.06⅜	.06⅝	.06⅜	.06⅝	.05⅞	.06¼
Rubber Solvents, stand grd, East, tks, wks ......gal.	...	.09½	.09	.09½	...	.09
Group 3, tks, wks ..gal.	.07⅜	.07½	.07⅜	.07½	.06⅞	.07¼
Stoddard Solvent, East, tks, wks ....gal.	...	.09½	.09	.09½	...	.09
Group 3, tks, wks ...gal.	.06⅞	.07	.06⅞	.07	.06⅜	.07
Phenol, 250-100 lb drs ....lb.	.14¼	.15	.14¼	.15	.14¼	.15
Phenyl-Alpha-Naphthylamine, 100 lb kgs ....lb.	...	1.35	...	1.35	...	1.35
Phenyl Chloride, drs .....lb.	...	.16	...	.16	...	.16
Phenylhydrazine Hydrochloride ....lb.	2.90	3.00	2.90	3.00	2.90	3.00
Phloroglucinol, tech, tins ..lb.	15.00	16.50	15.00	16.50	15.00	16.50
CP, tins ....lb.	20.00	22.00	20.00	22.00	20.00	22.00

Current

Phosphate Rock
Rosin Oil

	Current Market		1936 Low	1936 High	1935 Low	1935 High
Phosphate Rock, f.o.b. mines						
Florida Pebble, 68% basis ton	...	1.85	...	1.85	1.85	3.40
70% basis .. ..ton	...	2.35	...	2.35	2.35	3.90
72% basis ....ton	...	2.85	...	2.85	2.85	4.40
75-74% basis ....ton	...	3.85	...	3.85	3.85	5.40
75% basis ....ton	...	4.35	...	4.35	4.35	5.50
Tennessee, 72% basis ..ton	...	4.50	...	4.50	4.50	4.75
Phosphorous Oxychloride 175						
lb cyl .. ..lb.	.16	.20	.16	.20	.16	.20
Red, 110 lb cases ......lb.	.40	.44	.40	.45	.44	.45
Yellow, 110 lb cs, wks..lb.	.28	.33	.28	.33	.28	.33
Sesquisulfide, 100 lb cs..lb.	.38	.44	.38	.44	.38	.44
Trichloride, cyl ....lb.	.16	.20	.16	.20	.16	.20
Phthalic Anhydride, 100 lb						
drs, wks ....lb.	.14½	.15½	.14½	.15½	.14½	.15½
Pine Oil, 55 gal drs or bbls						
Destructive dist ....lb.	.44	.46	.44	.46	.44	.50
Steam dist wat wh bbls gal.	.64	.65	.64	.65	.64	.65
tks ....gal.	...	.59	...	.59	...	.59
Straw color, bbls ......gal.	...	.59	...	.59	...	.59
tks ....gal.	...	.54	...	.54	...	.54
Pitch Hardwood, wks ....ton	...	15.00	...	15.00	15.00	20.00
Burgundy, dom, bbls, wks lb.	...	.03½	...	.03½	...	.03½
Imported ....lb.	.11	.13	.11	.13	.11	.13
Coaltar, bbls, wks .....ton	...	19.00	...	19.00	...	19.00
Petroleum, see Asphaltum in Gums' Section.						
Pine, bbls ....bbl.	5.00	5.25	4.00	5.25	3.75	4.25
Stearin, drs ....lb.	.03	.04½	.03	.04½	.03	.04½
Platinum, refd ....oz.	45.00	48.00	34.50	64.00	35.00	38.00
POTASH						
Potash, Caustic, wks, sol..lb.	.06¼	.06½	.06¼	.06½	.06¼	.06½
flake ....lb.	.07	.07⅜	.07	.07⅜	.07	.07⅜
Liquid, tks ....lb.	...	.02⅞	...	.02⅞	...	.02⅞
Manure Salts, imported						
20% basis, blk ....ton	...	12.00	11.00	12.00	8.60	11.00
30% basis, blk ....ton	...	16.50	14.40	16.50	12.90	14.40
Potassium Acetate ....lb.	.26	.28	.26	.28	.26	.28
Potassium Muriate, 80% basis						
bgs ....ton	...	25.00	22.50	25.00	22.00	22.50
Dom, blk ....unit	...	.50	.45	.50	.40	.45
Pot & Mag Sulfate, 48% basis						
bgs ....ton	...	24.75	22.25	24.75	19.50	22.50
Potassium Sulfate, 90% basis						
bgs ....ton	...	36.25	33.75	36.25	33.75	35.00
Potassium Bicarbonate, USP						
320 lb bbls ....lb.	.09	.18	.09	.18	.07½	.09
Bichromate Crystals, 725 lb						
cks* ....lb.	.08½	.09	.08½	.09	.08⅛	.09
Binoxalate, 300 lb bbls..lb.	...	.23	...	.23	.22	.23
Bisulfate, 100 lb kgs ...lb.	.15½	.18	.15½	.18	.35	.36
Carbonate, 80-85% calc 800						
lb cks ....lb.	.07¼	.07½	.07¼	.07½	.07½	.07⅞
liquid, tks ....lb.	...	.02⅞	...	.02⅞	...	...
drs, wks ....lb.	.03⅛	.03¼	.03⅛	.03¼	...	...
Chlorate crys, 112 lb kgs,						
wks ....lb.	.09¼	.09½	.09¼	.09½	...	.09¾
gran, kgs ....lb.	.12	.13	.12	.13	.12	.13
powd, kgs ....lb.	.08	.08¼	.08	.08¼	.08¾	.09¾
Chloride, crys, bbls ....lb.	.04	.04¾	.04	.04¾	.04	.04¾
Chromate, kgs ....lb.	.23	.28	.23	.28	.23	.28
Cyanide, 110 lb cases ..lb.	.55	.57½	.55	.57½	.55	.57½
Iodide, 75 lb bbls ......lb.	1.10	1.15	1.10	1.25	1.25	1.40
Metabisulfite, 300 lb bbls lb.	...	.15	.13¾	.15	...	.15
Oxalate, bbls ....lb.	.25	.26	.25	.26	.16	.24
Perchlorate, cks, wks ...lb.	.09	.11	.09	.11	.09	.11
Permanganate, USP, crys,						
500 & 1000 lb drs, wks lb.	.18½	.19½	.18½	.19½	.18½	.19½
Prussiate, red, 112 lb kgs lb.	.35	.38½	.35	.38½	.35	.38½
Yellow, 500 lb casks.. lb.	.16	.18	.16	.19	.18	.19
Tartrate Neut, 100 lb kgs lb.	...	.21	...	.21	...	.21
Titanium Oxalate, 200 lb						
bbls ....lb.	.32	.35	.32	.35	.32	.35
Propane, group 3, tks ....lb.	.03	.04⅜	.03	.04⅜	...	.07
Pumice Stone, lump bgs ..lb.	.04½	.06	.04½	.06	.04½	.06
250 lb bbls ....lb.	.05	.07	.05	.07	.05	.07
Powd, 350 lb bgs ......lb.	.02½	.03	.02½	.03	.02½	.03
Putty, coml, tubs .....100 lb.	...	3.00	2.75	3.00	...	2.75
Linseed Oil, kgs ...100 lb.	...	4.75	4.50	4.75	...	4.50
Pyrethrum, conc liq:						
2.4% pyretherins, drs, frt						
allowed ....gal.	4.25	4.60	...	...	...	...
3.6% pyretherins, drs, frt						
allowed ....gal.	6.25	6.00	...	...	...	...
Flowers, coarse, Japan,						
bgs ....lb.	...	.11½	...	...	...	...
Fine powd, bbls......lb.	...	.14	...	...	...	...
Pyridine, 50 gal drs .....gal.	...	1.30	...	1.30	1.20	1.30
Pyrites, Spanish cif Atlantic						
ports, blk ....unit	.12	.13	.12	.13	.12	.13
Pyrocatechin, CP, drs, tins lb.	2.15	2.75	2.15	2.75	2.40	3.00
Quebracho, 35% liq tks ...lb.	...	.02⅞	.02⅝	.02⅞	...	.02⅝
450 lb bbls, c-l ....lb.	...	.03¾	.03⅛	.03¾	...	.03⅛
Solid, 63%, 100 lb bales						
cif ....lb.	...	.03⅞	.03⅝	.03⅞	...	.03⅝
Clarified, 64%, bales..lb.	...	.04⅜	.03⅞	.04⅜	...	.03⅞
Quercitron, 51 deg liq, 450 lb						
bbls ....lb.	.06	.06½	.06	.06½	.06	.06½
Solid, 100 lb boxes .....lb.	.10	.12	.10	.12	.10	.12
R Salt, 250 lb bbls, wks ..lb.	.52	.57	.52	.57	.44	.45
Resorcinol tech, cans .....lb.	.75	.80	.75	.80	.75	.80
Rochelle Salt, cryst ......lb.	.14	.14½	.14	.14½	.14	.15
Powd, bbls ....lb.	.13	.13½	.13	.13½	.13	.13½
Rosin Oil, bbls, first run gal.	...	.58	.38	.58	.36	.45
Second run ....gal.	...	.61	.43	.61	.43	.48
Third run, drs ....gal.	...	.66	.49	.66	.50	.60

* Spot price is ⅛c higher.

	Current Market		1936 Low	1936 High	1935 Low	1935 High
Rosins 600 lb bbls, 280 lb unit ex. yard NY:						
B	...	9.10	4.45	9.10	4.65	5.65
D	...	9.10	4.95	9.10	5.02½	5.75
E	...	9.10	5.15	9.10	5.15	5.90
F	...	9.10	5.40	9.10	5.20	5.95
G	...	9.10	5.50	9.10	5.25	6.00
H	...	9.10	5.60	9.10	5.25	6.00
I	...	9.10	5.70	9.10	5.25	6.00
K	...	9.10	5.55	9.10	5.27½	6.05
M	...	9.12½	5.60	9.12½	5.35	6.10
N	...	9.15	5.70	9.15	5.75	6.40
WG	...	9.15	5.85	9.15	5.95	6.87½
WW	...	9.85	5.90	9.85	6.25	7.55
Rosins, Gum, Savannah (280 lb unit):						
B	...	7.85	3.15	7.85	3.40	4.40
D	...	7.85	3.75	7.85	3.70	4.50
E	...	7.85	3.90	7.85	3.90	4.65
F	...	7.85	4.10	7.85	3.95	4.70
G	...	7.85	4.20	7.85	4.00	4.75
H	...	7.85	4.30	7.85	4.00	4.75
I	...	7.85	4.35	7.85	4.00	4.75
K	...	7.85	4.30	7.85	4.02½	4.80
M	...	7.87½	4.35	7.87½	4.10	4.85
N	...	7.90	4.45	7.90	4.50	5.15
WG	...	7.90	4.45	7.90	4.70	5.60
WW	...	8.60	4.55	8.60	5.15	6.25
X	...	8.60	4.55	8.60	5.20	6.25
Rosins, Wood, wks (280 lb unit), wks, FF	...	7.25	4.30	7.25	4.05	6.35
K	...	7.60	4.45	7.60	4.30	7.00
M	...	7.60	4.55	7.60	4.55	7.25
N	...	8.20	4.95	8.20	5.00	7.75
Rosin, Wood. c-l, FF grade, NY	...	8.62	6.10	8.62	4.92	5.62
Rotten Stone, bgs mines..ton	...	35.00	...	35.00	23.50	35.00
Lump, imported, bbls ...lb.	.05	.07	.05	.07	.05	.07
Selected, bbls. ....lb.	.08	.10	.08	.10	.08	.10
Powdered, bbls ....lb.	.02½	.05	.02½	.05	.02½	.05
Sago Flour, 150 lb bgs ....lb.	.02¾	.03¾	.02¾	.03¾	.02¾	.03¾
Sal Soda, bbls, wks ...100 lb.	...	1.15	1.15	1.30	...	1.30
Salt Cake, 94-96%, c-l, wks ton	19.00	23.00	19.00	23.00	13.00	18.00
Chrome, c-l, wks ......ton	12.00	13.00	11.00	13.00	12.00	13.00
Saltpetre, double refd, gran, 450-500 lb bbls ......lb.	.059	.06¼	.059	.06¼	.059	.06¼
Powd, bbls ....lb.	.069	.07⅞	.069	.07⅞	.069	.07⅞
Cryst, bbls ....lb.	.069	.08	.069	.08	.069	.08
Satin, White, 550 lb bbls..lb.	...	.01½	..	.01½	...	.01½
Shellac, Bone dry, bbls..lb. r	.18	.18½	.17½	.26½	.19	.32
Garnet, bgs ....lb.	.16	.17	.16	.20	.17	.27
Superfine, bgs ....lb. s	.14½	.16	.14½	.18	.16	.28
T. N., bgs ....lb. s	.13½	.14	.13½	.16	.13	.25
Schaeffer's Salt, kgs .....lb.	.48	.50	.48	.50	.48	.50
Silver Nitrate, vials .....oz.	.32⅞	.34⅞	.32 5/16	.34⅞	.36⅜	.53¾
Slate Flour, bgs, wks ....ton	9.00	10.00	9.00	10.00	9.00	10.00
Soda Ash, 58% dense, bgs, c-l, wks ....100 lb.	...	1.25	..	1.25	...	1.25
58% light, bgs .....100 lb.	...	1.23	...	1.23	...	1.23
blk ....100 lb.	...	1.05	...	1.05	...	1.05
paper bgs ....100 lb.	...	1.20	...	1.20	...	1.20
bbls ....100 lb.	...	1.50	...	1.50	...	1.50
Soda Caustic, 76% grnd & flake, drs ....100 lb.	...	3.00	...	3.00	...	3.00
76% solid, drs .....100 lb.	...	2.60	...	2.60	...	2.60
Liquid sellers, tks, 100 lbs.	...	2.25	...	2.25	...	2.25
Sodium Abietate, drs .....lb.	...	.08	...	.08	...	.08
Acetate, tech, 450 lb bbls, wks ....lb.	.04½	.05	.04½	.05	.04½	.05
Alignate, drs ....lb.	...	.64	...	.64	...	.64
Antimoniate, bbls ......lb.	.12	.12½	.12	.14	...	...
Arsenate, drs ....lb.	...	.10½	...	.10½	...	.10½
Arsenite, liq, drs .....gal.	.40	.75	.40	.75	.40	.75
Benzoate, USP, kgs ....lb.	.46	.48	.46	.48	.46	.48
Bicarb. 400 lb bbl. wks 100 lb.	...	1.75	1.75	1.85	...	1.85
Bichromate, 500 lb cks, wks* ....lb.	.06½	.07	.06½	.07	.06⅛	.07
Bisulfite, 500 lb bbl, wks lb.	.03¼	.036	.03¼	.036	.03¼	.036
35-40% sol cbys, wks 100 lb.	1.95	2.10	1.95	2.10	1.95	2.10
Chlorate, bgs, wks .....lb.	.06¼	.07½	.06¼	.07½	.06¼	.07½
Chloride, tech ....ton	13.60	16.50	13.60	16.50	13.60	16.50
Cyanide, 96-98%, 100 & 250 lb drs, wks ......lb.	.15½	.17½	.15½	.17½	.15½	.17½
Fluoride, 90%, 300 lb bbls, wks ....lb.	.07½	.08¼	.07¼	.08¼	.07¼	.08¼
Hydrosulfite, 200 lb bbls, f.o.b. wks ....lb.	.17	.18	.17	.19	.18	.21
Hyposulfite, tech, pea crys 375 lb bbls, wks 100 lb.	2.50	3.00	2.50	3.00	2.50	3.00
Tech, reg cryst, 375 lb bbls, wks ......100 lb.	2.40	2.75	2.40	2.75	2.40	2.75
Iodide ....lb.	1.90	1.95	1.90	2.05	2.00	2.40
Metal, drs, 280 lbs .....lb.	...	.19	...	...	...	...
Metanilate, 150 lb bbls..lb.	.41	.42	.41	.42	.41	.42
Metasilicate, gran, c-l, wks ....100 lb.	...	2.15	2.15	3.00	2.65	3.05
cryst, bbls, c-l, wks 100 lb.	...	2.75	2.75	3.25	...	3.25
Monohydrate, bbls .....lb.	...	.023	..	.023	...	.02½
Napthenate, drs ....lb.	...	.09	...	.09	...	.09
Naphthionate, 300 lb bbl lb.	.52	.54	.52	.54	.52	.54
Nitrate, 92%, crude, 200 lb bgs, c-l, NY ....ton	...	26.80	24.80	26.80	...	24.80
100 lb bgs ....ton	...	27.50	25.50	27.50	...	25.50
Bulk ....ton	...	25.50	23.50	25.50	...	23.50

r Bone dry prices at Chicago 1c higher; Boston ½c; Pacific Coast 3c; Philadelphia deliveries f.o.b. N. Y.; refined 6c higher in each case; s T. N. and Superfine prices quoted f.o.b. N. Y. and Boston: Chicago prices 1c higher; Pacific Coast 3c; Philadelphia f.o.b. N. Y. * Spot price is ⅛c higher.

Current

Sodium Nitrite
Terpineol

	Current Market		1936 Low	1936 High	1935 Low	1935 High
Sodium (continued):						
Nitrite, 500 lb bbls .....lb.	.0710	.08	.0710	.08	:07¼	.08
Orthochlorotoluene, sulfonate, 175 lb bbls, wks..lb.	.25	.27	.25	.27	.25	.27
Perborate, drs, 400 lbs..lb.	.14¾	.15¼	.14¾	.18	.17	.19
Peroxide, bbls, 400 lb ..lb.	...	.17	...	.17	...	.17
Phosphate, di-sodium, tech, 310 lb bbls, wks 100 lb.	...	1.95	1.95	2.30	2.20	2.30
bgs, wks ....100 lb.	...	1.75	1.75	2.10	2.00	2.10
tri-sodium, tech, 325 lb bbls, wks ....100 lb.	...	1.95	1.95	2.30	2.30	2.70
bgs, wks ....100 lb.	...	1.75	1.75	2.10	2.10	2.60
Picramate, 160 lb kgs ..lb.	.67	.69	.67	.69	.67	.69
Prussiate, Yellow, 350 lb bbl, wks ....lb.	.10	.11½	.10	.12	.11½	.12
Pyrophosphate, anhyd, 100 lb bbls ....lb.	...	.10	.10	.132	.102	.15
Silicate, 60°, 55 gal drs, wks ....100 lb.	1.65	1.70	1.65	1.70	1.65	1.70
40°, 35 gal drs, wks 100 lb.	...	.80	...	.80	...	.80
tks, wks ....100 lb.	...	.65	...	.65	...	.65
Silicofluoride, 450 lb bbls NY ....lb.	.06½	.07	.05¼	.07¼	.04¼	.05
Stannate, 100 lb drs ....lb.	.34½	.37½	.28½	.37½	.31	.38
Stearate, bbls ....lb.	.20	nom.	.20	.26	.20	.25
Sulfanilate, 400 lb bbls..lb.	.16	.18	.16	.18	.16	.18
Sulfate Anhyd, 550 lb bgs* c-l, wks ....100 lb. †	1.45	1.90	1.30	1.90	1.25	2.35
Sulfide, 80% cryst, 440 lb bbls, wks ....lb.	...	.02¼	...	.02¼	...	.02¼
62% solid, 650 lb drs, c-l, wks ....lb.	...	.03	...	.03	...	.03
Sulfite, cryst, 400 lb bbls, wks ....lb.	.023	.02½	.023	.02½	.023	.02½
Sulfocyanide, bbls ......lb.	.28	.47	.28	.47	.32	.42½
Sulforicinoleate, bbls ...lb.	...	.12	...	...	...	...
Tungstate, tech, crys, kgs lb.	.85	.90	.85	.90	...	.90
Sorbitol, com., drs, basis content, wks ....lb.	...	.25	...	...	...	...
Spruce Extract, ord, tks...lb.	...	.01	...	.01	...	.01
Ordinary, bbls ....lb.	...	.01½	...	.01½	...	.01½
Super spruce ext, tks....lb.	...	.01⅝	...	.01⅝	...	.01⅝
Super spruce ext, bbls...lb.	...	.01⅞	...	.01⅞	...	.01⅞
Super spruce ext, powd, bgs ....lb.	..	.04		.04	...	.04
Starch, Pearl, 140 lb bgs 100 lb.	3.80	4.00	2.99	4.30	3.13	3.78
Powd, 140 lb bgs....100 lb.	2.90	4.10	3.90	4.54	3.23	3.66
Potato, 200 lb bgs......lb.	.04½	.05½	.04½	.05½	.04½	.06
Imp, bgs ....lb.	.05	.06	.05	.06	.05¾	.06½
Rice, 200 lb bbls ....lb.	...	.07¼		.07¼	.07¼	.08½
Wheat, thick, bgs ......lb.	.08¼	.08½	.08¼	.08½	...	.08¼
Strontium carbonate, 600 lb bbls, wks ....lb.	.07¼	.07½	.07¼	.07½	.07¼	.07½
Nitrate, 600 lb bbls, NY lb.	.08¾	.09½	.08¾	.09½	.08¾	.09½
Sucrose octa-acetate, den, grd, bbls, wks ....lb.	.45	...	.45	...	...	...
tech, bbls, wks ....lb.	.40	...	.40	...	...	...
Sulfur	...	...	...	...	...	...
Crude, f.o.b. mines ....ton	18.00	19.00	18.00	19.00	18.00	19.00
Flour, coml, bgs ....100 lb.	1.60	2.35	1.60	2.35	1.60	2.35
bbls ....100 lb.	1.95	2.70	1.95	2.70	1.95	2.70
Rubbermakers, bgs ..100 lb.	2.20	2.80	2.20	2.80	2.20	2.80
bbls ....100 lb.	2.55	3.15	2.55	3.15	2.55	3.15
Extra fine, bgs .....100 lb.	2.40	3.00	2.40	3.00	2.40	3.00
Superfine, bgs ......100 lb.	2.20	2.80	2.20	2.80	2.20	2.80
bbls ....100 lb.	2.25	3.10	2.25	3.10	2.25	3.10
Flowers, bgs ....100 lb.	3.00	3.75	3.00	3.75	3.00	3.75
bbls ....100 lb.	3.35	4.10	3.35	4.10	3.35	4.10
Roll, bgs ....100 lb.	2.35	3.10	2.35	3.10	2.35	3.10
bbls ....100 lb.	2.50	3.25	2.50	3.25	2.50	3.25
Sulfur Chloride, red, 700 lb drs, wks .. ..lb.	.05	.05½	.05	.05½	.05	.05½
Yellow, 700 lb drs, wks lb.	.03½	.04½	.03½	.04½	.03½	.04½
Sulfur Dioxide, 150 lb cyl lb.	.06½	.08½	.06½	.08½	.08½	.10
Multiple units, wks ....lb.	.05½	.06	.05½	.06	...	.06½
tks, wks ....lb.	.04½	.04¾	.04½	.04¾	...	.04¾
Refrigeration, cyl, wks .. lb.	.10	.13	.10	.13	...	.13
Multiple units, wks .....lb.	.07	.09¼	.07	.09¼	...	.09¼
Sulfuryl Chloride ....lb.	.15	.40	.15	.40	.15	.40
Sumac, Italian, grd ......ton	...	54.00	52.00	60.00	50.00	65.00
Extract, 42°, bbls ......lb.	.04½	.16½	...	...	...	...
Superphosphate, 16% bulk, wks .... ton	..	8.00	8.00	8.25	8.25	8.50
Run of pile ....ton	..	7.50	7.50	7.75	7.75	8.00
Triple, 44-45%, a. p. a. bulk, wks Balt. unit ... ton		.70	...	...	...	...
Talc, Crude, 100 lb bgs, NY ton	13.00	15.00	13.00	15.00	14.00	15.00
Refd, 100 lb bgs, NY ton	14.00	16.00	14.00	18.00	16.00	18.00
French, 220 lb bgs, NY ton	23.00	30.00	22.00	30.00	22.00	30.00
Refd, white, bgs .....ton	45.00	60.00	45.00	60.00	45.00	60.00
Italian, 220 lb bgs to arr ton	60.00	62.00	60.00	75.00	70.00	75.00
Refd, white, bgs, NY ton	65.00	70.00	65.00	80.00	75.00	80.00
Tankage Grd, NY ....unit *u*	...	3.85	2.65	4.00	2.35	3.00
Ungrd ....unit *u*	...	3.85	2.40	3.85	2.15	2.50
Fert grade, f.o.b. Chicago ....unit *u*	...	3.75	2.40	3.75	2.25	2.65
South American cif..unit *u*	...	3.90	2.70	3.90	2.45	3.15
Tapioca Flour, high grade, bgs ....lb.	.03½	.05½	.03½	.05½	.0215	.05
Tar Acid Oil, 15%, drs ..gal.	.21	.24	.21	.24	.21	.23½
25%, drs ....gal.	.24½	.27½	.24	.27½	.23	.26½
Tar, pine, delv, drs .....gal.	...	.26	.25	.26	.25	.26
tks, delv ....gal.	...	.20	...	.20	...	.20
Tartar Emetic, tech ......lb.	.24¾	.25	.24¾	.25	.22¾	.25
USP, bbls ....lb.	.28	.28½	.28	.28½	.28	.28½
Terpineol, den grd, drs ...lb.	.13¾	.14¾	.13¾	.14¾	.13¾	.14¾
tks ....lb.	.13	.14	.13	.14	.13	.14

† Bags 15c lower; *u* + 10; * Bbls. are 20c higher.

	Current Market		1936 Low	1936 High	1935 Low	1935 High
Tetrachlorethane, 650 lb drs lb.	.08	.08½	.08	.08½	.08½	.09
Tetrachloroethylene, drs, tech ....lb.	.10	.10½	...	...	...	...
Tetralene, 50 gal drs, wks lb.	.12	.13	.12	.13	.12	.13
Thiocarbanilid, 170 lb bbl. .lb.	.20	.25	.20	.25	.20	.25
Tin, crystals, 500 lb bbls, wks lb.	.39	.39½	.35	.39½	.36	.39½
Metal, NY ....lb.	...	.52½	.40½	.52½	.456	.52½
Oxide, 300 lb bbls, wks lb.	.55	.57	.47	.57	.51	.58
Tetrachloride, 100 lb drs, wks ....lb.	...	.26½	.21¼	.26½	.24¾	.26¼
Titanium Dioxide, 300 lb bbls lb.	.16	.19	.16¼	.19¼	.17¼	.19¼
Barium Pigment, bbls ..lb.	.05¾	.06	.05¾	.06½	.06¼	.06½
Calcium Pigment, bbls ..lb.	.05¾	.06	.05¾	.06½	.06¼	.06½
Toluol, 110 gal drs, wks gal.	..	.35	...	.35	...	.35
8000 gal tks, frt allowed gal.	...	.30	...	.30	...	.30
Toluidine, mixed, 900 lb drs, wks ....lb.	.27	.28	.27	.28	.27	.28
Toner Lithol, red, bbls ....lb.	.75	.80	.75	.80	.75	.80
Para, red, bbls ....lb.	...	.75	...	.75	...	.75
Toluidine, bgs ....lb.	...	1.35	...	1.35	...	1.35
Triacetin, 50 gal drs, wks lb.	.32	.36	.32	.36	.32	.36
Triamylamine, drs, wks ..lb.	...	1.25	...	1.25	...	1.25
Triamyl Borate, lcl, drs, wks lb.	...	.27	...	...	...	...
Trichlorethylene, 600 lb drs, frt allowed E. Rocky Mts lb.	.089	.094	.089	.094	.09½	.10
Triethanolamine, 50 gal drs wks ....lb.	.26	.30	.26	.30	.26	.38
tks, wks ....lb.		.25	...	.25	...	...
Tricresyl Phosphate, drs ..lb.	.22½	.26	.19	.26	.21	.23
Triphenyl Guanidine ....lb	58	.60	.58	.60	.58	.60
Tripoli, airfloated, bgs, wks ton	27.50	30.00	27.50	30.00	27.50	30.00
Tungsten, Wolframite per unit	15.00	15.25	15.00	15.25	15.00	15.25
Turpentine (Spirits), c-l, NY dock, bbls ....gal.	...	.45¾	.40½	.50	.43¾	.55½
Savannah, bbls ....gal.	...	.40¾	.35½	.45	.38¾	.50¼
Jacksonville, bbls ....gal.	.38½	.39	.35¼	.44½	.38¾	.50¼
Wood Steam dist, bbls, c-l, NY ....gal.	...	.42	.38	.47	.43	.50
Urea, pure, 112 lb cases ..lb.	.14½	.15½	.14½	.17	.15½	.17
Fert grade, bgs, c.i.f. ..ton						
c.i.f. S.A. points ....ton	95.00	110.00	95.00	110.00	100 00	120.00
Urea, dom, f.o.b., wks....ton	95.00	110.00	95.00	110.00	..	..
Urea Ammonia liq 55% NH_3, tks ....unit	No prices			.96	..	96
Valonia beard, 42%, tannin bgs ....ton	...	48.00	46.00	64.50	40.00	58.00
Cups, 32% tannin, bgs..ton	...	34.00	34.00	42.00	26.00	49.00
Mixture, bark, bgs ....ton	...	Nom.	...	Nom	...	32 00
Vanilin, ex eugenol, 25 lb tins, 2000 lb lots ....lb.	...	3.65	3.65	3.75	...	...
Ex-guaiacol ....lb.	...	3.55	3.55	3.65		...
Vermillion, English, kgs ..lb.	1.75	1.85	1.52	1.85	1.48	1.71
Vinyl Chloride, 16 lb cyl ..lb.	...	1.00	...	1.00	..	1.00
Wattle Bark, bgs ....ton	...	30.00	26.50	30.00	29.00	32.00
Extract, 60°, tks, bbls ..lb.	...	.03⅝	...	.03⅝	...	.03¾
WAXES						
Wax, Bayberry, bgs ....lb.	.17½	.20	.17½	.20	.17½	.23
Bees, bleached, white 500 lb slabs, cases ....lb.	.36	.38	.34	.38	.33½	.34
Yellow, African, bgs..lb.	.25	.25½	.24	.27	.21	.25½
Brazilian, bgs ....lb.	.27½	.28½	.25	.28½	.21½	.26½
Chilean, bgs ....lb	.27½	.28½	.25	.28½	.21½	.26½
Refined, 500 lb slabs, cases ....lb.	28	30	.28	.30	.27½	.28
Candelilla, bgs ....lb.	.15	.16	.14	.17½	.10	.17½
Carnauba, No. 1, yellow, bgs ....lb.	.44½	.46	.43½	.48	.35	.54
No. 2, yellow, bgs ....lb.	.43½	.44	.42	.46	.34	.51
No. 2, N. C., bgs ....lb.	.38	.38½	.38	.40	.26½	.43½
No. 3, Chalky, bgs ...lb.	.34	.35½	.34	.38	.21	.42½
No. 3, N. C., bgs ....lb.	.34½	.35	.34	.41	.22½	.43
Ceresin, white, imp, bgs lb.	.43	.45	.43	.45	.43	.45
Yellow, bgs ....lb.	.36	.38	.36	.38	.36	.38
Domestic, bgs ....lb.	.08	.11	.08	.11	.08	.11
Japan, 224 lb cases ....lb.	.09	.09¼	.08	.09¼	.06	.09
Montan, crude, bgs ....lb.	.10¾	.11¾	.10¾	.11¾	.10½	.11¾
Paraffin, see Paraffin Wax.						
Spermaceti, blocks, cases lb.	.23	.24	.22	.24	.19	.24
Cakes, cases ....lb.	.24	.25	.23	.25	.20	.25
Whiting, prec 200 lb bgs, c-l, wks .... ton	...	15.00	...	15.00	12.00	15.00
Alba, bgs, c-l, wks ....ton	...	15.00	...	15.00	...	15.00
Gliders, bgs, c-l, wks ..ton	11.50	14.50	11.50	15.00	...	15.00
Wood Flour, c-l, bgs ....ton	18.00	30.00	18.00	30.00	18.00	30.00
Xylol, frt allowed, East 10° tks, wks ....gal.	...	.33	...	.33	.27	.33
Coml, tks, wks, frt allowed ....gal.	...	.30	...	.30	.26	.30
Xylidine, mixed crude, drs lb.	.36	.37	.36	.37	.36	.37
Zinc, Carbonate tech, bbls, NY ....lb.	.09½	.11	.09½	.11	.09½	.11
Chloride fused, 600 lb drs, wks ....lb.	.04½	.05¾	.04½	.05¾	.04½	.05¾
Gran, 500 lb bbls, wks ..lb.	.05	.05¾	.05	.05¾	.05	.05¾
Soln 50%, tks, wks..100 lb.	...	2.00	...	2.00	...	2.00
Cyanade, 100 lb drs ....lb.	.36	.37	.36	.38	.36	.41
Zinc Dust, 500 lb bbls, c-l, delv ....lb.	...	.0705	.068	.0755	.057	.0685
Metal, high grade slabs, c-l, NY ....100 lb.	...	5.45	...	5.425	4.05	5.22½
E. St. Louis ....100 lb.	...	5.05	4.80	5.05	3.70	4.85
Oxide, Amer, bgs, wks..lb.	.05	.05½	.05	.05½	.05	.06¼
French, 300 lb bbls, wks lb.	.05½	.07	.05½	.07	.05½	.10⅞
Palmitate, bbls ....lb.	.22	.23	.22	.23	.21	.23
Perborate, 100 lb drs ...lb.	...	1.25	...	1.25	...	1.25
Peroxide, 100 lb drs ...lb.		1.25	...	1.25	...	1.25
Resinate, fused, dark, bbls lb.	.09	.10	.05¾	.10	.05¾	.06½
Stearate, 50 lb bbls ....lb.	.20	.23	.19	.23	.18	.22

Current

Zinc Sulfate
Oil, Whale

	Current Market		1936 Low	1936 High	1935 Low	1935 High
Zinc Sulfate, crys, 400 lb bbl, wks ....lb.	.028	.033	.028	.033	.028	.033
Flake, bbls ....lb.	.032	.035	.032	.035	.032	.035
Sulfide, 500 lb bbls, delv lb.	.09¼	.09¾	.09¼	.11¾	.10¾	.11¾
bgs, delv ....lb.	.09	.09½	.09	.11½	.10½	.11½
Sulfocarbolate, 100 lb kgs ....lb.	.24	.25	.24	.25	.24	.25
Zirconium Oxide, Nat kgs lb.	.02½	.03	.02½	.03	.02½	.03
Pure, kgs ....lb.	.45	.50	.45	.50	.45	.50
Semi-refined, kgs ......lb.	.08	.10	.08	.10	.08	.10

Oils and Fats

	Current Market		1936 Low	1936 High	1935 Low	1935 High
Castor, No. 3, 400 lb bbls..lb.	.10¼	.10¾	.10¼	.10¾	.09¾	.10¾
Blown, 400 lb bbls .....lb.	.12¼	.13	.12¼	.13	.11½	.16
China Wood, bbls spot NY lb.	.13	.13½	.13	.19¼	.094	.40
Tks, spot NY ....lb.	...	.125	.125	.19	.088	.35
Coast, tks ....lb.	...	.127	.127	.18	.087	.24
Coconut, edible, bbls NY..lb.	...	.12½	.09¼	.12½	.04	.12
Manila, tks, NY ....lb.	.07	nom.	.04⅛	.07	.03¾	.06¼
Tks, Pacific Coast ....lb.	.06¾	nom.	.03⅞	.06¾	.03⅜	.06
Cod, Newfoundland, 50 gal bbls ....gal.	...	.48½	.40	.48½	.34	.38
Copra, bgs, NY ....lb.	.0410	nom.	.0320	.0410	.02	.038
Corn, crude, tks, mills ....lb.	...	.09	.08	.09¾	.08¾	.11
Refd, 375 lb bbls, NY ..lb.	.12½	.12¾	.10¾	.13	.11½	.14
Cottonseed, see Oils and Fats News Section.						
Degras, American, 50 gal bbls. NY ....lb.	.07¼	.07¾	.05¼	.07¾	.04½	.06
English, bbls, NY......lb.	.11¾	.12¼	.08¾	.12¼	.04¾	.06½
Greases, Yellow ....lb.	.07½	.07¾	.03⅜	.07¾	.05	.06¾
White, choice bbls, NY lb.	.07¾	.08¾	.04⅛	.08¾	.05¼	.08½
Herring, Coast, tks ......gal.	...	.31	...	.31	.23	.33
Lard Oil, edible, prime ...lb.	...	.14¼	.12¾	.14½	.09¾	.20½
Extra, bbls ....lb.	...	.11	.09½	.11	.08½	.11¾
Extra, No. 1, bbls ......lb.	...	.10¼	.07¾	.10¼	.08¼	.11
Linseed, Raw, less than 5 bbl lots ....lb.	.10	.104	.104	.104	.091	.1130
bbls, c-l, spot ....lb.	.092	.096	.096	.096	.083	.102
Tks ....lb.	.086	.09	.086	.097	.0770	.096
Menhaden, tks, Baltimore gal.	...	.35	.25	.36	.25	.36
Refined, alkali, drs .....lb.	...	.08	.066	.082	.061	.082
Tks ....lb.	...	.074	.062	.074	.055	.072
Light pressed, drs ......lb.	...	.074	.06	.076	.055	.076
Tks ....lb.	...	.068	.056	.068	.049	.066
Kettle bodied, drs .....lb.	...	.09	.08	.096	...	...
Neatsfoot, CT, 20° bbls, NY ....lb.	...	.16¼	.16	.16¾	.16¼	.16¾
Extra, bbls, NY ....lb.	...	.10½	.08	.10½	.08½	.11¼
Pure, bbls, NY ....lb.	...	.11½	.11½	.12¼	.11¾	.13¼
Oiticica, bbls ....lb.	.10¼	.10½	.10	.15½	.13½	.28
Oleo, No. 1, bbls, NY ....lb.	...	.12	.09¼	.12½	.10¾	.14½
No. 2, bbls, NY ....lb.	...	.11½	.08¾	.12	.10	.13¾
Olive, denat, bbls, NY ...gal.	...	1.25	.73	1.50	.82	.95
Edible, bbls, NY ......gal.	1.80	nom.	1.60	2.25	1.55	1.90
Foots, bbls, NY ....lb.	.09¼	.09⅜	.08	.09½	.07⅛	.10
Palm, Kernel, bulk ....lb.	...	.06¼	.04¾	.06¼	...	...
Niger, cks ....lb.	.04⅞	.05¼	.04	.05¼	.034	.05¼
Sumatra, tks ....lb.	...	.05⅛	.03¾	.05⅜	...	...
Peanut, crude, bbls, NY ..lb.	...	.09¼	.08	.09½	...	...
Tks, f.o.b. mill ....lb.	...	.09	.07¾	.09¼	.08¾	.10¾
Refined, bbls, NY ......lb.	...	.12½	.12	.13¼	.12½	.14
Perilla, drs, NY ....lb.	.09¾	.09⅞	.07	.10	.07¼	.10¼
Tks, Coast ....lb.	.09⅜	.09½	.066	.09½	.068	.08½
Pine, see Pine Oil, Chemical Section.						
Rapeseed, blown, bbls, NY lb.	.11¼	.12	.086	.12	.07½	.09
Denatured, drs, NY ...gal.	...	.75	.52	.75	.40	.56
Red, Distilled, bbls ....lb.	.10⅛	.11⅝	.08⅝	.11⅝	.07⅜	.10⅝
Tks ....lb.	...	.09¼	.07¾	.09¼	.06½	.08¾
Salmon, Coast, 8000 gal tks ....gal.	...	.32	.31	.32½	.25	.35
Sardine, Pac Coast, tks ..gal.	.37½	nom.	.28	.39	.24½	.37½
Refined alkali, drs ......lb.	...	.08	.066	.082	.065	.082
Tks ....lb.	...	.074	.062	.074	.06	.072
Light pressed, drs ......lb.	...	.074	.06	.076	.055	.076
Tks ....lb.	...	.068	.056	.068	.049	.066
Sesame, yellow, dom .....lb.	.13	.13¼	.12¾	.14½	.12¼	.15½
White, dos ....lb.	.13	.13¼	.12¾	.14½	.12¾	.15½
Soy Bean, crude						
Dom, tks, f.o.b. mills ...lb.	...	.087	.07	.087	.08	.10
Crude, drs, NY ......lb.	.093	.099	.076	.099	.086	.11
Refd, bbls, NY ....lb.	.098	.107	.081	.107	.091	.115
Tks ....lb.	.092	.097	.07½	.097	.08	.10½
Sperm, 38° CT, bleached, bbls NY ....lb.	.098	.10	.094	.101	.099	.101
45° CT, bleached, bbls, NY ....lb.	.091	.093	.087	.094	.092	.094
Stearic Acid, double pressed dist bgs ....lb.	11	.12	.08½	.12	.10	.12¼
Double pressed saponified bgs ....lb.	.11¼	.12¼	.09	.12¼	.09	.12¾
Triple pressed dist bgs..lb.	.14	.15	.11¼	.15	.12¾	.15¼
Stearine, Oleo, bbls ......lb.	.09¼	.09½	.07¼	.10½	.09¼	.12½
Tallow City, extra loose ..lb.	...	.07⅝	.04⅛	.07⅝	.05⅜	.07⅜
Edible, tierces ....lb.	...	.08½	.06¾	.09¼	.07¼	.09¼
Acidless, tks, NY ......lb.	...	.09⅞	.07	.09⅞	.07½	.10¾
Turkey Red, single, bbls ..lb.	.08	.08½	.08	.08½	.07½	.08½
Double, bbls ....lb.	.12½	.13	.12½	.13½	.12½	.13½
Whale:						
Winter bleach, bbls, NY lb.	.081	.083	.072	.083	.07	.083
Refined, nat, bbls, NY . lb.	.077	.079	.068	.079	.064	.081

THE CHEMICAL MARKET-PLACE

Local Suppliers

A directory of responsible manufacturers' agents and jobbers maintaining spot stocks

Rhode Island

GEO. MANN & CO., INC.
251 Fox Pt. Blvd., Providence, R. I.
(Phone—Gaspee 8466)
Branch Office
NORTH STATION INDUSTRIAL BLDG.
150 Causeway St., Boston, Mass.
(Phone—Capital 2217 and 2218)
Industrial Chemicals
Glycerine
Stearic Acid

ANILINE OIL
Heavy Chemicals
Textile Specialties
J. U. STARKWEATHER CO.
INCORPORATED
705 Hospital Trust Bldg.
Providence, R. I.

New York

CHEMICAL SALES CORP.
1386 Niagara St.
BUFFALO, N. Y.
Chemicals
Alcohols - Solvents
For All Industries

INDUSTRIAL CHEMICALS
AND
BASIC RAW MATERIALS
Serving N. Y. State, Penna. and Canadian Industry
Since 1915
ROLLS CHEMICAL COMPANY
Ellicott Sq. Bldg., Buffalo, N. Y.

Massachusetts

ALAN A. CLAFLIN
Manufacturers' Agent
DYESTUFFS and CHEMICALS
Specializing in
BENTONITE
AND
TALC
88 Broad Street Boston, Mass.
TELEPHONE LIberty 5999

DOE & INGALLS, INC.
Chemicals
Solvents
DENATURED ALCOHOL
Full List of Our Products, see Chemical Guide-Book
Everett Station, Boston EVerett 4610

Pennsylvania

FOR ALL INDUSTRIAL USES
CHEMICALS
SINCE 1855
AFCO BRAND
Spot Stocks
Technical Service
ALEX. C. FERGUSSON CO.
Drexel Building PHILADELPHIA, PA.
Lombard 2410-11-12

Illinois

CLARENCE MORGAN
INCORPORATED
[Chemicals]
TELEPHONE SUPERIOR 2462
919 NORTH MICHIGAN AVENUE, CHICAGO
If it is a CHEMICAL *we have it or will tell you where to secure it*

E. & F. KING & Co., Inc.
Est. 1834
399-409 Atlantic Avenue
Boston, Mass.
Industrial Chemicals
(CO_2)
Solid Carbon Dioxide

New Jersey

AMERICAN OIL & SUPPLY CO.
Distributors
Acids
Chemicals
Alcohols
Coal Tar Solvents
Petroleum Solvents
Newark, N. J. Trenton, N. J.

ESOTOO
(Liquid Sulphur Dioxide)
METHYL CHLORIDE
ZINC SULPHATE
STRIPPING AGENTS
66 Distribution Points in the United States and Canada
VIRGINIA SMELTING COMPANY
West Norfolk, Virginia
131 State St., Boston 76 Beaver St., New York

IMPORTERS and EXPORTERS
of
INDUSTRIAL CHEMICALS
AND
RAW MATERIALS
IRVING M. SOBIN CO., INC.
72-74 Granite Street, Boston, Mass.
Telephone: SOUth Boston 3973

Buy Christmas Seals

THE CHEMICAL MARKET-PLACE

Wants & Offers

Rates—All classifications, $1.00 an insertion for 20 words or less, additional words 5c each per issue: 10c for forwarding mail if box number address is used. ¶ Three insertions for the price of two. Payment with order.

Chemical Industries
149 Temple St.,
New Haven, Conn.

Situations Wanted

AMBITIOUS, YOUNG ANALYTICAL CHEMIST desires position with chemical manufacturing concern. Have three years' experience in analytical laboratory. Excellent qualifications. Box 1201, CHEMICAL INDUSTRIES.

AZO CHEMIST with 20 years' supervisory experience in large scale production, plant operation, and chemical control. Own formulae on complete line of azo colors, celanese and formaldehyde black, green, blue, and brown colors. Box 1196, CHEMICAL INDUSTRIES.

ANALYTICAL and RESEARCH CHEMIST has specialized in research on industrial wastes. Box 753, CHEMICAL INDUSTRIES.

CHEMIST and PRODUCTION MANAGER with extended work in silk dyeing and weighting. Box 754, CHEMICAL INDUSTRIES.

PRODUCTION CHEMIST with experience in cotton printing and converting dyes for printing. Box 755, CHEMICAL INDUSTRIES.

ANALYTICAL and RESEARCH CHEMIST has had work in cupra-ammonium rayon and production of cotton prints. Box 756, CHEMICAL INDUSTRIES.

MANUFACTURING CHEMIST has formulated paints, varnishes and their removers; also cleaning fluids, lacquer specialties and wax emulsions. Box 757, CHEMICAL INDUSTRIES.

CHEMICAL GRADUATE (woman) who is also skilled in stenography and chemical (or physical) abstracting wants chemical position. Box 758, CHEMICAL INDUSTRIES.

Help Wanted

CHEMIST WANTED—Recent graduate in chemistry. Young man well trained in organic chemistry and preferably with some experience in the dyestuff or organic chemical field. In letter of application please enclose photograph, state education, age, and experience. Box 1200, CHEMICAL INDUSTRIES.

EXPERIENCED CHEMIST in manufacture of graphite and colored leads. Write full information to Box 1202, CHEMICAL INDUSTRIES.

Business Opportunities

Confidential Services

A mature, well-informed, well-trained chemical engineer offers consulting service on new products, processes, sales, and technical developments, purchasing of equipment and supplies. Companies without New York offices will find this unique service particularly valuable. Box 1205, CHEMICAL INDUSTRIES.

WELL-ESTABLISHED FIRM IN INDIA wishes to act as distributors for manufacturers of chemicals, dyes, perfumes, patent medicines, and toilet requisites. Excellent bank references and best of connections all over India. Please communicate with full particulars with S. N. Thunihunwalla, Mohta House, 29, Strand Road, Calcutta, India.

Business Opportunities

PARTNERSHIP WANTED with small established manufacturer by sales and advertising manager with $10,000. Correspondence confidential. Box 1198, CHEMICAL INDUSTRIES.

PATENT TO BE SOLD: Will revolutionize dry cleaning industry; product completely soluble in benzine and other solvents; reduces quantity of solvent used; remarkable cleaning properties; degreases benzine, etc. Box 1204, CHEMICAL INDUSTRIES.

Real Estate

CHEMICAL BUILDING TO LEASE IN NEW YORK CITY

SIX STORY AND BASEMENT BUILDING in heart of food district, 27 x 175 feet, running through two streets, with loading platforms and elevator at each end of building, capacity 250 lb. to square foot, available January 1. Building has been occupied by one of largest chemical concerns for over 25 years. Box 1203, CHEMICAL INDUSTRIES.

Instruction

INDUSTRIAL CHEMISTRY — elementary and advanced courses. Class instruction, Phila., and N. Y., mail elsewhere. Francis Brown, Ph.D., Consulting and Analytical Chemist, Box 1159, CHEMICAL INDUSTRIES.

PATENT YOUR IDEAS
REGISTER YOUR TRADE-MARK BY
Z. H. POLACHEK
1234 BROADWAY
31st. NEW YORK
REG. PATENT ATTORNEY PROF. ENGINEER
WHAT IS YOUR INVENTION?
Send me a simple sketch or a model for Confidential Advice—Do it Now!

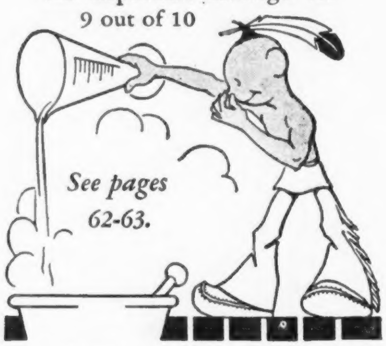
Index to Advertisers

Index to Advertisers

"We"—Editorially Speaking

CHEMICAL EXECUTIVES

An important message for 9 out of 10



What the Anaconda Copper Company thinks of you.

"Partial scores at the end of the third period" (as your favorite broadcaster would say) shows Columbia leading the field for the number of degrees granted to those whose biographies will appear in the forthcoming second edition of THE CHEMICAL WHO'S WHO. Our statistical department reports that of the 5128 biographies prepared to date for the printer the record stands:

Columbia	330
M. I. T.	308
Johns Hopkins	276
Cornell	246
Illinois	235
Chicago	226
Wisconsin	218
Yale	218
Michigan	199
Ohio	168
California	127
Harvard	120
Minnesota	112
Penn State	112
Iowa	109

Just below the century mark are Purdue with 99 and Princeton with 97. And beyond that—well, you'd be surprised how many colleges there are. We are going to compile the complete score and give it to you after the book is published after the first of the year.

While our eagle eye has been trained on colleges we have noticed a few more oddities among the hobbies—the chief chemist of Washburn-Crosby makes briar pipes; two chaps in California, Carl E. S. Strem and Willett L. Hardin go in in a big way for avocado; Dr. H. D. Young collects cook books (we've made a fair collection of cooks ourselves in the past fifteen years); Earl Whitford, Oldbury's sales manager, collects lumber jack stories which naturally suggests a round robin with Fred Zinsser, Ralph Dorland, "Hercules" McKinney, and Fred Neuberg.

But for sheer versatility our bonnet is off to the Hon. Francis P. Garvan. He has long been famous for his chemico-politico-economic-legal-forensic-socialite activities, for his hackney ponies, his early American silverware, and his antique furniture. Last month his cocker spaniel, My Own on Time, won the all-age stakes at the Verbank field trials.

Fifteen Years Ago

From our issues of December 1921

Henry Howard, Grasselli Chemical, elected president, American Institute Chemical Engineers.

General Pershing, head, Advisory Committee of American Arms Conference, recommends complete abandonment of all forms of chemical warfare.

John E. Teeple at meeting of A. C. S. tells members that Germans again control potash market.

Executors of estate of John C. Wiarda sell business to Howard B. Bishop who will continue business under name of John C. Wiarda & Co., Inc.

Abbott Labs. begin construction of new plant at 14th and State Sts., No. Chicago; work estimated to cost $450,000.

Du Pont plans resumption of operations in its synthetic camphor factory at Deepwater Point, Del.

Loss by explosion at Heyden Chemical's plant at Garfield, N. J., estimated at $778,000.

H. H. S. Handy resigns as director and vice-president of Allied Chemical & Dye, and Dr. Wm. G. Beckers is elected a director.

Wm. M. Burton, Standard Oil (Ind.), to be awarded Perkin Medal.

WARNING

The Blackstone Studios and/or The Associated News Photographic Service, both operating from 20 West 57th Street, New York City, are using the name of "Chemical Industries" to secure entrée to people in the chemical field, representing that they are taking photographs for us. This is an entirely unwarranted use of our name. No photographer is authorized, except in writing and for specific purposes, to take photographs for this magazine.

And while we are salaaming, we want to salute Theron H. Butterworth, of Borden's technical staff, for one of the most unusual accomplishments, to wit: authorship of a play for children entitled "Mr. Samuel Whiskers".

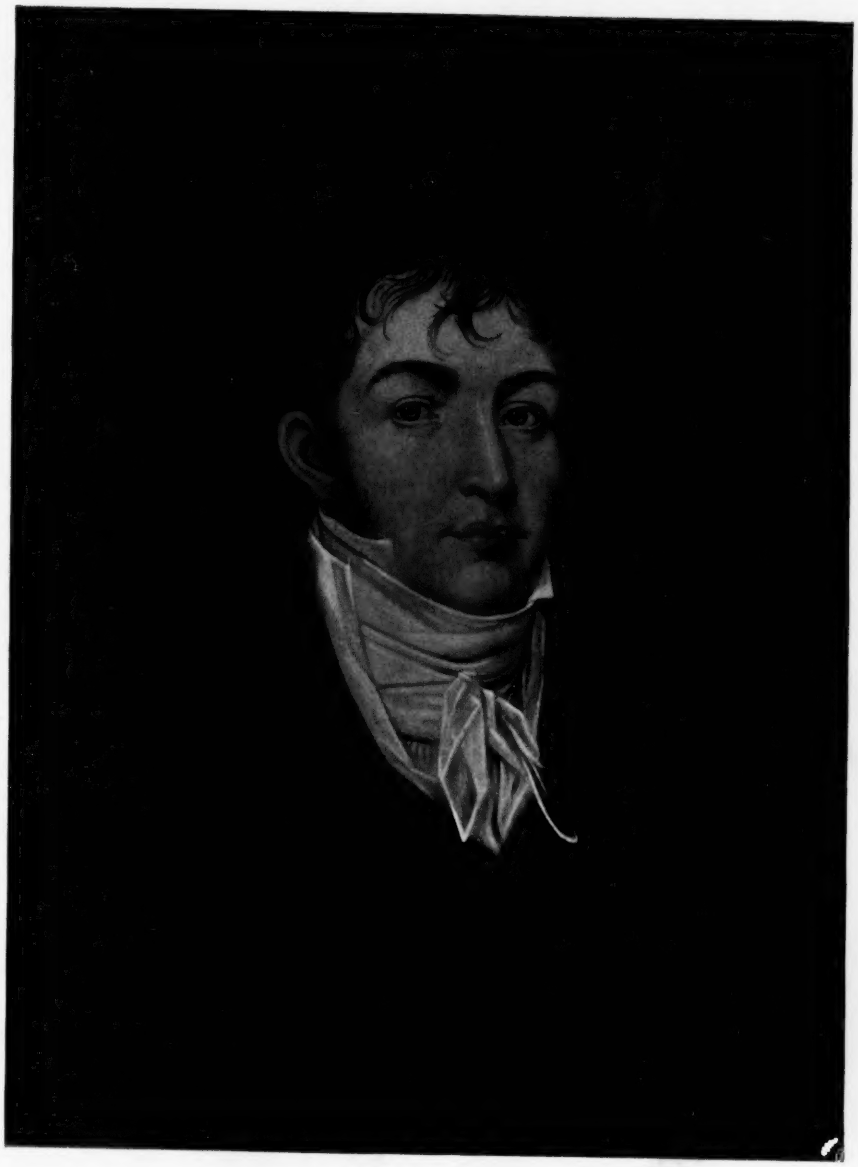
We add to our collection of man-bites-dog items, the fact that Billy Hale writes an article for the Monsanto house organ. Furthermore and moreover, they print his very life-like likeness and describe him as "consultant of an eminent competitor, Dow Chemical Company," thus establishing W. J. H. as tops in chemical publicity.

Dr. Iago Goldston, executive secretary of the Medical Information Bureau of the New York Academy of Medicine, has a name we like a lot, but find exceedingly difficult to spell. In writing our brief editorial comment on the terrible tongue thrashing he gave Science, we wrote "Gallstone" once, "Goldstone" twice, and eventually lapsed into Yiddish and set down "Goldstein".

Our favorite garage man explains the shortage of Prestone. It's because it is made out of carbon, and du Pont has been using carbon for the manufacture of gas masks.

Query—did Langmuir or Urey pose for the hero of the movie thriller "Alibi for Murder"?

EQUIPMENT'S CONTRIBUTION TO CHEMICAL PROGRESS



JOHN HARRISON
1733-1833
BUILDER OF THE FIRST PLATINUM STILL IN AMERICA

Being a Record of the Accomplishments of American Manufacturers of Chemical Apparatus and Containers. Published by CHEMICAL INDUSTRIES.

Equipment's Contribution to Chemical Progress

A Record of Technical Accomplishment and Service to Industry Made by Manufacturers of Apparatus, Containers, and Engineering Materials

Compiled and Published by

CHEMICAL INDUSTRIES

The Business Magazine of Chemistry

New York, N. Y. New Haven, Conn.

Printed in the United States of America

Foreword

IN the spring of 1935, at the time when the American Chemical Society was celebrating the Tercentenary of the first manufacture of chemicals in the United States, we published a volume, similar in format and scope to this book, which was entitled "Chemical Industry's Contribution to the Nation." In that work were set forth the histories of sixty-five leading American chemical companies. The interest and value of this record of American chemical manufacturing accomplishment was instantly and widely recognized, and one of the country's leading manufacturers of chemical equipment suggested that a companion volume, setting forth the contribution which apparatus and engineering materials of all sorts have made to the advancement of our chemical process industries, would be a fitting and appropriate undertaking for us.

"There is no doubt," he said, "that American chemical process industries have the best equipment in the world. Not only is their apparatus fabricated in all the most recently perfected materials, but they also have immediately available a wide range of different styles and types, far beyond what is in stock abroad except on special order and at considerable extra cost. More than this, the American manufacturers of apparatus maintain technical staffs of high quality and render an enormous amount of invaluable chemical engineering services.

"The story of American chemical apparatus has never been told. It is an unknown portion of our industrial history of real interest and import. It should be permanently recorded in dignified, authentic form, and widely distributed."

The ideals and objectives set forth in this suggestion are, we trust, realized in the present volume. It has been our sincere purpose to tell this story completely and accurately, and we are indebted to those firms which have cooperated with us to this end. The first international gathering of chemical engineers held since the World War is the appropriate occasion for the publication of this record of the tools and materials of their profession.

It is quite true that our chemical and chemical process industries are able easily to do many things which without modern equipment would be utterly impossible. This is notably true in the case of reactions, growing so common, which are carried on under very high pressures or at very high temperatures. Often the practical, commercial development of these processes, notably the operations of ammonia synthesis, hydrogenation, and petroleum cracking, were utterly impractical until the proper equipment had also been developed. In many cases, this engineering task has been quite as arduous as was the solution of the chemical problems involved.

In like manner, all of the delicate and complicated instruments of measurement, and the multitude of indicators, have made possible the

extension of the continuous operation under automatic control which has been so distinguishing a feature of our newer industrial chemical operations of a mass scale during the past two decades.

This history of the growth of the equipment manufacturing industry from the local tinsmith, coppersmith, and blacksmith, into the great plants, with their elaborate research organizations, and their highly trained technical sales staffs, is indeed a fascinating story. This foreword is not the proper place to record in detail the contributions in technique and in service which these firms have made and are making to American chemical progress. That is the purpose of this book, and the credit for these accomplishments should be closely associated with those firms which have rendered these great services and made these very real contributions to chemical progress.

The Evolution of the Chemical Equipment Industry

IN our early chemical plants the apparatus was mostly home-made. Our pioneer chemical manufacturers were to an exceptional degree rugged individualists. The original conception of the enterprise was usually theirs, and they commonly furnished the working capital. Often they devised their own processes, designed the apparatus, and then operated the plant. Having made their products, they went out and sold them; and, in the end, were sometimes forced to turn bill collector.

From first to last, they were intimate with every detail—both technical and commercial—of their business. They almost invariably started with a small-scale, single-unit operation, though many of their plants grew into sizable enterprises, turning out a large number of chemicals. The industrial tradition of that day was one of individual management and personal responsibility, so that the proprietor of a chemical plant was, *ipso facto*, financier and sales manager, chemist and engineer, all in one. These were arduous duties, calling for many and different talents; but the companies they managed were very modest in comparison with our great corporations, and there were no sales conferences, nor trade conventions, nor golf courses, while the working hours in the office were from eight to six.

John Harrison, student of Priestley, pioneer manufacturer of sulfuric acid and builder of the first platinum still in America, the forerunner of our chemical engineers. Bust by Lawrence Tenney Stevens.

Modern distillation units bear little resemblance to this early equipment, yet the alchemist's still above includes preheater and cooled head. (Libavius, "Alchymia," Frankfurt, 1606). Courtesy Gustav Egloff.

Though John Winthrop, who built the first chemical manufactory in 1635, had followers who became makers of chemicals during colonial days, it was, nevertheless, not till 1792 that a chemical company which became a permanent success was founded. Since chemicals are preeminently industrial materials, a national chemical industry flourishes in proportion to the general industrial activity of that country, and the sporadic colonial attempts at chemical production were starved to death because they lacked a market.

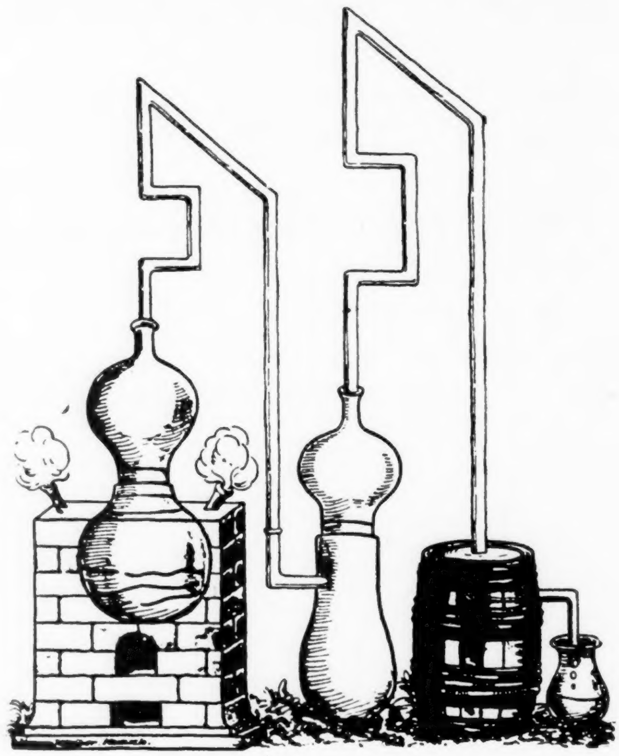
After the Revolution, however, a strong patriotic sentiment sought to achieve commercial independence now that political independence had been won. Both Jefferson and Hamilton, diametrically opposed as were their political theories, agreed in the importance of fostering home industries and encouraging invention. In 1790, the year after the Constitution was ratified, the first tariff law was passed and the Patent Office established.

It was amid these more favorable influences that John Harrison began the production of sulfuric acid. He was fortunate, too, in his location, for Philadelphia was then the most considerable manufacturing center and quickly became American chemical headquarters.

Finally, he displayed good business sense in the product he made. The high ocean freights on so dangerous a material as sulfuric acid, packed in such perishable containers as glass carboys, gave him a very attractive differential between his domestic costs and imported selling prices.

What little we know of John Harrison and his pioneer acid works is all typical of the scraps of fact and family tradition that remain of all our early chemical manufacturers. He was at once a shrewd business executive and a practical chemical maker. But undoubtedly his first interest was his plant. He studied chemistry under the exiled Joseph Priestley, and in 1794, two years after he began operations, he went to Europe especially to learn the newest and best methods of chemical production.

His first "leaden chamber," which he designed himself, was, to quote Scharf and Westcott's "History of Philadelphia," "of trifling capacity . . . about one carboy of vitriol in a working day, or about 300 carboys a year, making altogether about 45,000 pounds." In 1806, after his journey abroad, he built a much larger

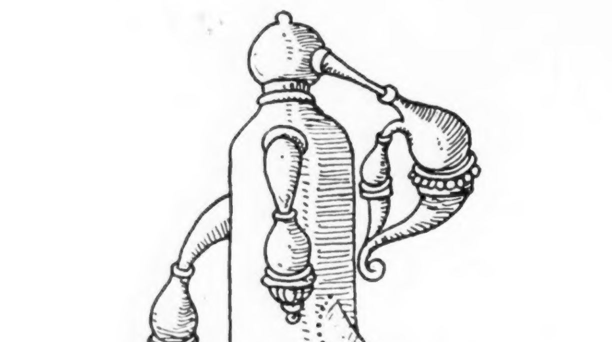


Still with reflux, dephlegmator, and condenser. (Lonicer, "Kunstliche Conterfeytunge," Frankfurt, 1573.) Courtesy Gustav Egloff.

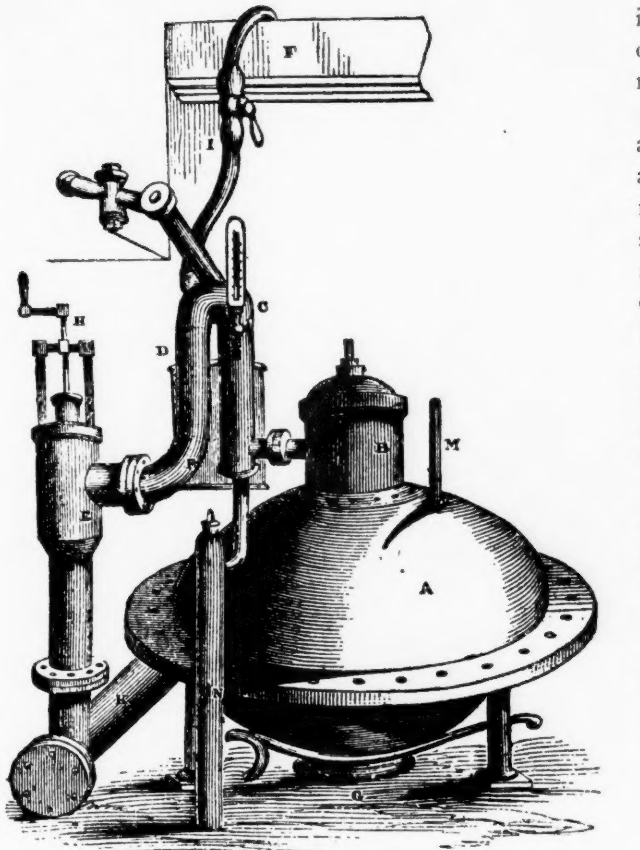
chamber—50 feet long, 18 feet high, and 18 feet wide—which increased his output to over 350,000 pounds a year. This plant on Green Street, just west of Third, was destroyed by fire on May 14, 1809. Accordingly, Mr. Harrison decided to remove out into the country to a tract of fourteen acres at Kensington Avenue and 18th Street, and there to build a veritable giant of sulfuric acid plants. In the center of his plant area, he erected a chamber exactly double the size of the destroyed unit. In this he burned approximately a ton of Sicilian sulfur daily. About this installation grew up a whole series of stone and wooden buildings in which he produced crude pyroligneous liquor, refined acetic acid, sugar of lead, alum, copperas, iron liquor, lead oxides, and a number of pigments. Indeed, the manufacture of dry colors came in time to be the chief business of the Harrison works.

It has been often observed that the chemical industry, along with its astonishing increase in output, has more greatly and more consistently than any other industry lowered its prices. No other chemical is so universally used as sulfuric acid, and its production is an accurate indicator of industrial activity. Harrison's pioneer plant produced, in 1792, 300 carboys, or less than the daily output of a modern large-scale operation. He sold his output for 15 cents a pound. Today, we produce in the United States some six or seven million tons of 50° acid, and most of it is sold on contract to large consumers who pay less than a penny a pound for it.

Like a number of the early chemists and chemical manufacturers, John Harrison was originally a pharma-



Distillation tower taking off five streams. (Libavius, "Alchymia," Frankfurt, 1606.) Courtesy Gustav Egloff.



The modern chemical engineer is rather surprised to discover that even in the crude apparatus of his early predecessors were embodied sound principles of design and operation as shown in this vacuum pan patented by Howard a century ago. Courtesy "The Chemical Age."

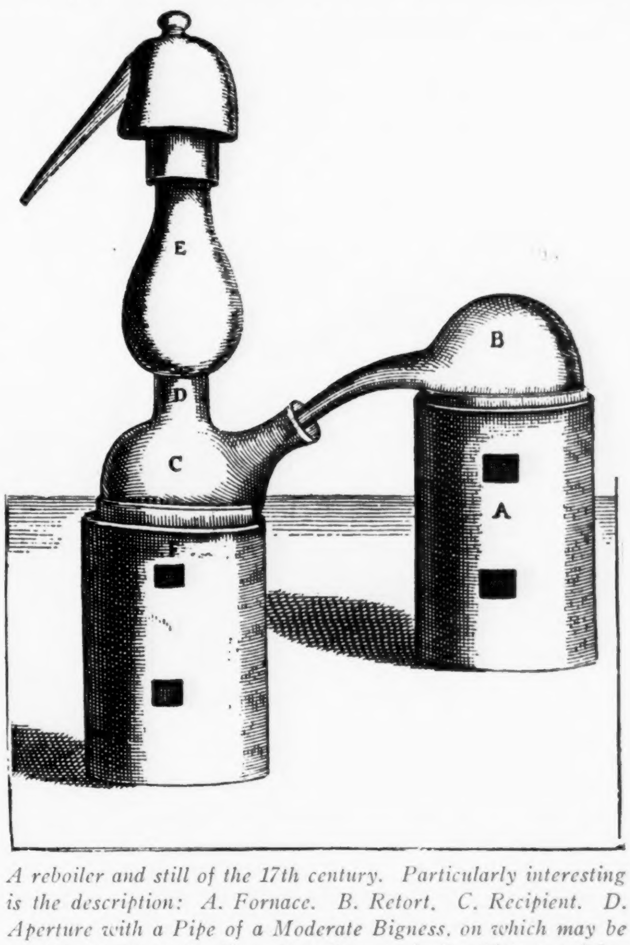
cist. It is likely, therefore, that he had more scientific training than many of his chemical contemporaries. But he was not exceptional in his preoccupation with plant problems. In 1814, he was quick to take advantage of a technical discovery of his fellow Philadelphian, Wollaston, thus becoming the first acid maker in the world to replace glass with platinum in his concentrating stills. Dr. Eric Bollman built to Mr. Harrison's design a platinum-lined still, weighing 700 ounces and with a capacity of 25 gallons. This expensive apparatus fully justified itself, for it was operated by Mr. Harrison for fifteen years, and was eventually replaced by larger equipment of the same material and only slightly modified design at the time the whole works were moved from Kensington Avenue to Gray's Ferry Road.

Along with this dominating—often domineering—master, there was in all our early chemical plants a sort of jack-of-all-metals, known by the humble title of "plant plumber." He was tinsmith, coppersmith, blacksmith, all in one. He worked in lead and could even make small castings. He was a versatile and ingenious workman, and though his duties were various and numerous, he was, nevertheless, the first specialist employed by the chemical industry.

The "plumber" was, first of all, the maintenance man of the works. He kept the plant in running condition. In addition, he was development engineer, working out improvements in layout and apparatus, while he was often called upon to build new equipment both for replacements and new processes.

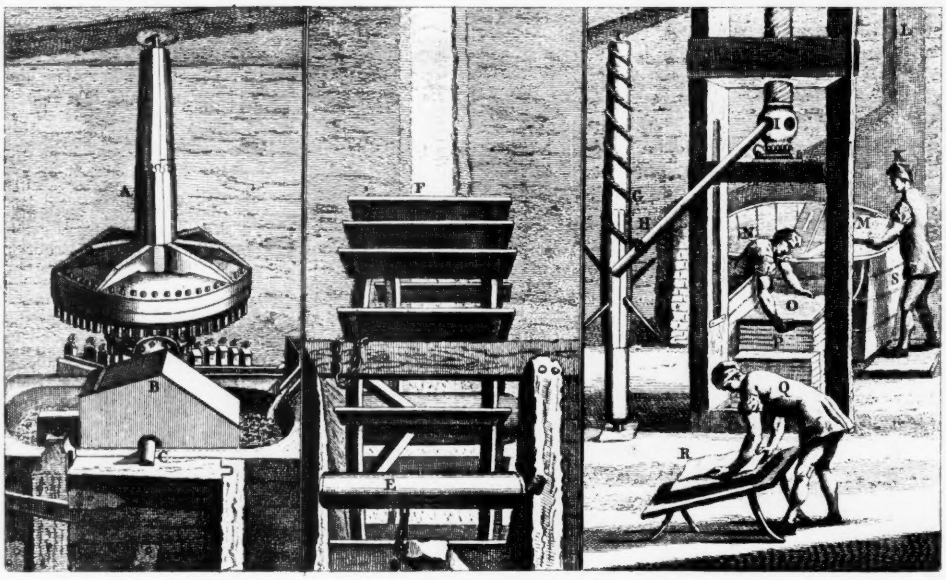
Gradually, however, as the operations grew in size and complexity, the equipment demanded became larger and more intricate. With the development of other manufacturing activities too, each of the larger cities soon came to support a whole variety of service shops, small boiler works, local machine shops, tinsmiths and coppersmiths, little foundries. Drawings and patterns from the workrooms, at once office and laboratory, of our chemical pioneers found their way more and more frequently into these neighborhood shops. More and more important equipment came to be fabricated outside the chemical plants.

These early fabricators of our chemical apparatus were men of much the same stamp as the pioneer chemical manufacturers, artificers in metal, master workmen whose skill and foresight, courage and perseverance, won them an independent position of leadership. They trained their own apprentices, planned the jobs, and no finished work left their shops without their personal inspection. Like the chemical makers, they thoroughly understood every detail of their business,



A reboiler and still of the 17th century. Particularly interesting is the description: A. Fornace. B. Retort. C. Recipient. D. Aperture with a Pipe of a Moderate Bigness, on which may be set the Alembeck E. The other Fornace is F, which containing a moderate Fire, sublimes what falls into the receiving Vessel up into the Alembeck E. And so the Matter which is distilled from the Retort B, by the Fire of the Fornace F, is presently sublimed; which may not only be useful in this Case, but also in every Sublimation of other Matters. (Valentine, "Triumphal Chariot of Antimony," London, 1655.) Courtesy Gustav Egloff.

The manufacture of paper was conducted in this crude equipment in the early part of the Eighteenth Century. Engraving from the Collection of Williams Haynes.



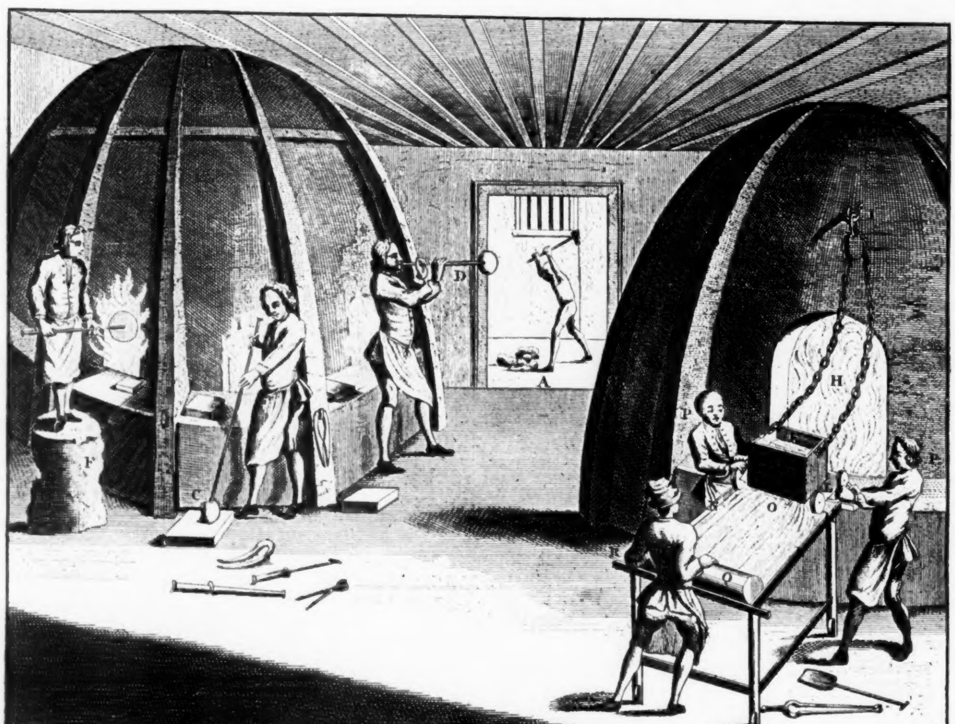
and it was natural that close, understanding relationships were frequently formed between such kindred spirits. In fact, many a knotty problem of our infant chemical industry was solved by some local coppersmith or blacksmith; and, on the other hand, there are great firms today, world famous for their stills and filter presses, which owe their start to the advice and custom of our older chemical firms.

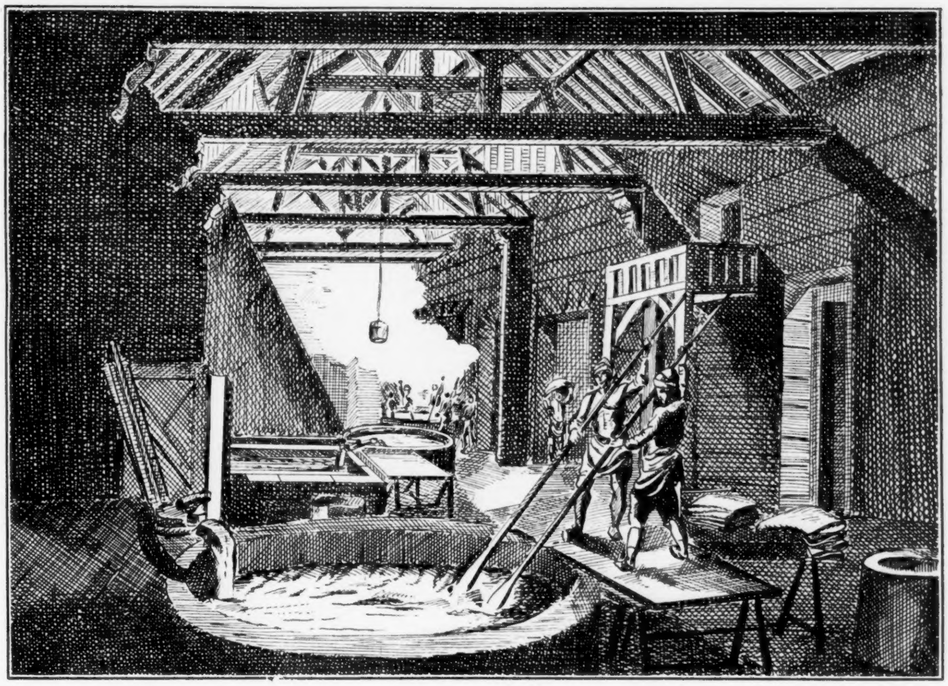
The chemical equipment industry, remained a purely local, specialized, made-to-order business till the era of great industrial expansion that followed the Civil War. But if only a few of our apparatus-making companies go back beyond the seventies or eighties of the last century, it is remarkable how long many of the basic principles involved in carrying on standard chemical operations have been well known.

A gigantic columnal still with its automatic controls for the most accurate, continuous separation of liquids, for example, certainly appears to be an ultra-triumph of engineering skill. It is. Yet Egloff and Lowry (*Ind. & Eng. Chem.*, XXI, 10, 920) have shown that the old alchemists back in the sixteenth century employed fractional distillation and very thoroughly understood the principles of (1) taking several streams from the fractionating tower, (2) refluxing, (3) external regulation of still-head temperature, (4) reboiling of condensates for increased fractionation, (5) preheating liquid before distillation, (6) feeding liquid into the still while in operation.

Likewise, we are prone to think of reactions at high temperatures under pressure as almost a post-war development, associated in our minds with ammonia synthesis. The alchemists used sealed iron bombs which were the legitimate forefathers of the autoclave

An interesting example of manufacturing operations in a process industry two hundred years ago. The several methods of blowing and casting plate glass, with the men at work. Engraving from the collection of Williams Haynes.





An early Sixteenth Century woodcut illustrating dyeing wool in an open kettle by hand, a method still prevalent in many dyehouses.
Courtesy Ciba Co., Inc.

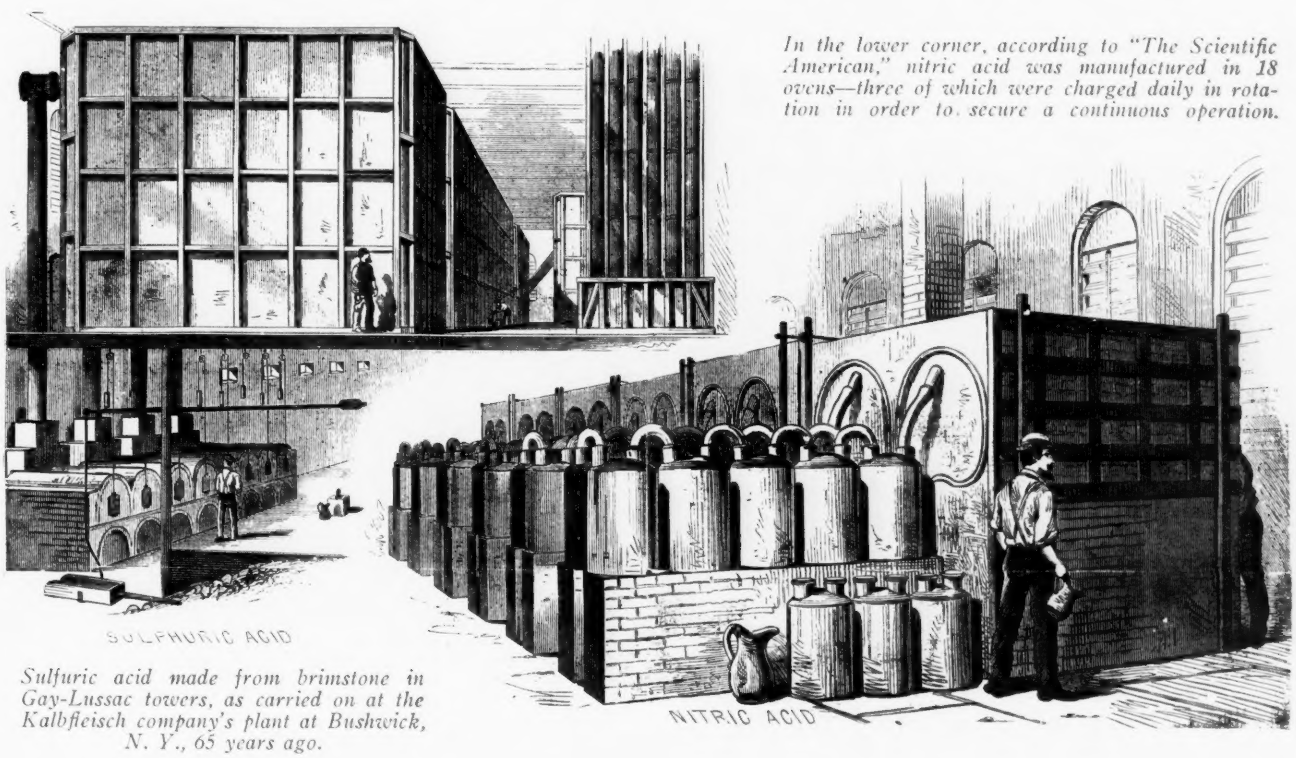
whose direct ancestor was the pressure digester used by Papin in 1661 for extracting marrow from bones. This vessel was fitted with a safety valve, operated upon the weight and lever principle. Over a century ago, Howard, the discoverer of mercury fulminate, designed a vacuum pan which his drawing shows plainly embodies principles that even present-day knowledge has not disproved.

A glance through the pages of such old classics as Muspratt's "Chemistry" or Davis' "Chemical Engineer" reveals illustration after illustration of vacuum pans, stills, filter presses, pressure vessels, mixing and grinding machinery that are not only easily recognizable, but which scrutiny reveals are designed with a clear understanding of the fundamental principles involved.

What then, has been the great contribution of the equipment makers to chemical progress?

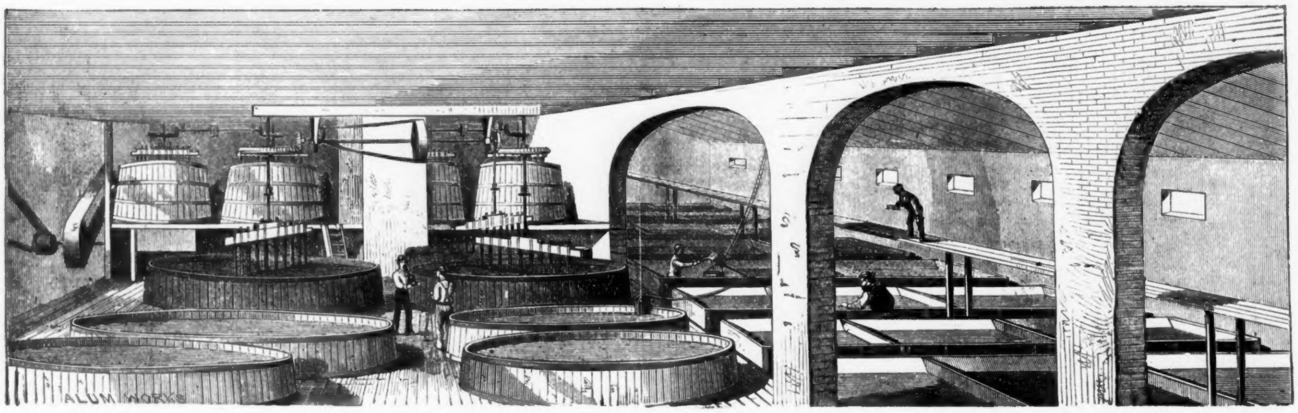
Leaving aside the inventions of special designs and the very great improvement in the materials of chemical engineering, the basic contribution has been the substitution of scientific for empirical methods in the design and construction of our chemical plants.

A great British chemical maker of the old school has been quoted as summing up a long life of practical



In the lower corner, according to "The Scientific American," nitric acid was manufactured in 18 ovens—three of which were charged daily in rotation in order to secure a continuous operation.

Sulfuric acid made from brimstone in Gay-Lussac towers, as carried on at the Kalbfleisch company's plant at Bushwick, N. Y., 65 years ago.



Three-quarters of a century ago, alum was made in such a plant as illustrated above. Another operation in the Kalbfleisch works as shown in an article published in "The Scientific American."

experience in these words: "We have now been manufacturing chemicals for over seventy-five years and have found that it has always been necessary to build a plant three times before it is found thoroughly satisfactory."

A vast gulf separates this theory of chemical plant building from the record as established by the bromine-from-seawater operation. Here a well known reaction was involved but under novel and extremely exacting conditions. So carefully was the project engineered that in its second month of operation, the plant produced 105 per cent. of its projected capacity.

Vividly that portrays the differences between the old-time and the up-to-date conception of building a chemical plant and the amazing difference in the results obtained from the "practical" rule of thumb methods and scientific design and construction. Cut-and-try was all very well when plants were small and output limited, markets local and competition not too severe. A large-scale, continuous, mass production installation upon a keenly competitive basis, requires a heavy capital investment and demands an exact pre-knowledge of capacities and costs. To rebuild such a plant three times in order to secure operating efficiency would be financially ruinous.

If there has been surprisingly little change in the basic principles involved in many of our unit operations, there has been astonishing progress in knowledge of both the physical and chemical facts behind these operations. The result has been a much more accurate and economical design of apparatus. In welding technique, in the size and proportion of vessels and pipes, in the weight and cubic space of apparatus, great improvement has been made.

Two very notable contributions have come along with the more intelligent design of chemical plant equipment. New, specialized engineering materials—alloyed steels, copper, silver, aluminum, rubber, synthetic resins—make possible on a commercial scale reactions impractical but a few years ago.

The continuous automatic operation has not only vastly increased the output for a given plant investment, but in many cases it has raised efficiencies and so materially lowered costs. This is not only true of thermal efficiency, but also of such operations as crystallization, evaporation, distillation, and others which are more easily performed upon a continuous than upon a batch basis. Furthermore, the continuous process has emphasized the balance of energy and materials, which in turn points clearly to recoverable losses of raw materials and to the costs of heat and power. Such emphasis has naturally stimulated improvements in both process and plant which have been quite as valuable in increasing efficiency as have the lower costs of mass production itself. We must remind ourselves that continuous, automatic chemical processes would be utterly impossible were it not for a wide variety of accurate instruments for measuring, recording, and controlling flows, temperatures, and pressures.

Indeed, it is to be suspected that executives, engineers, and chemists far too often overlook their debt to the makers of plant materials, plant equipment, and plant control instruments. "We forget," as Dr. Milton C. Whitaker said recently, "that we are doing easily every day many things we could not do at all were it not for the improvements in these tools of chemical engineering."

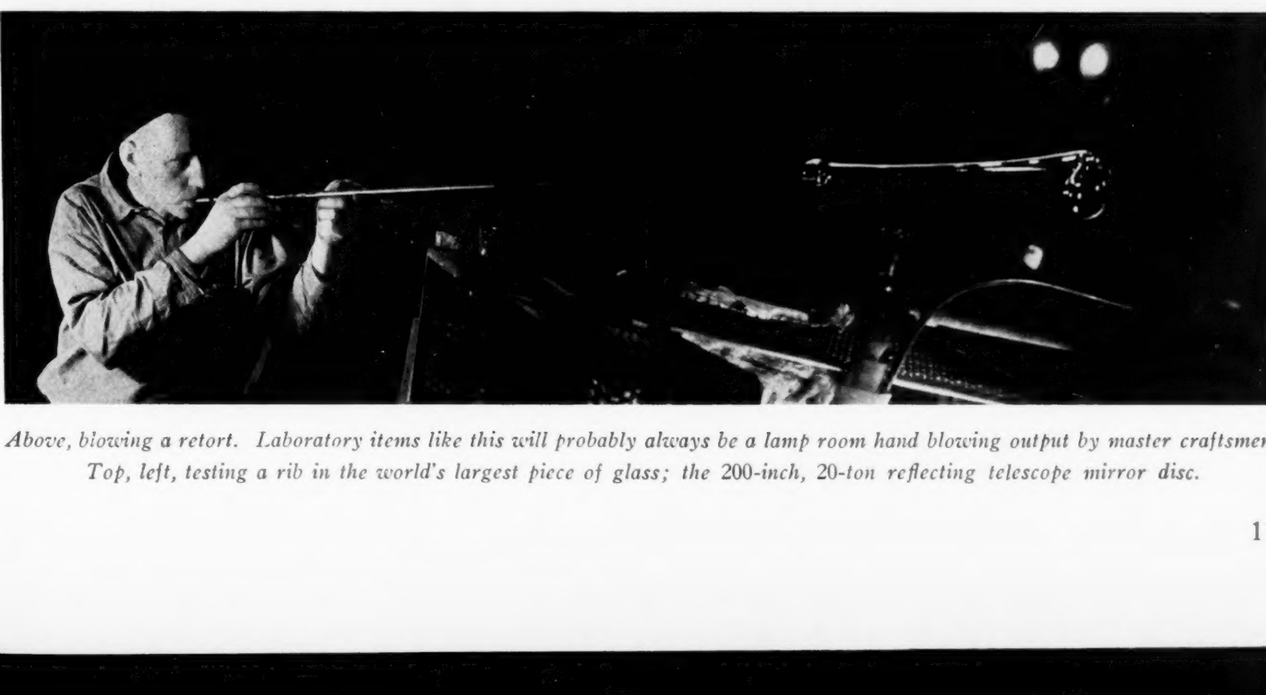
Pyrex Protection from Test Tube to Tonnage

Corning in the Equation of Chemical Industries

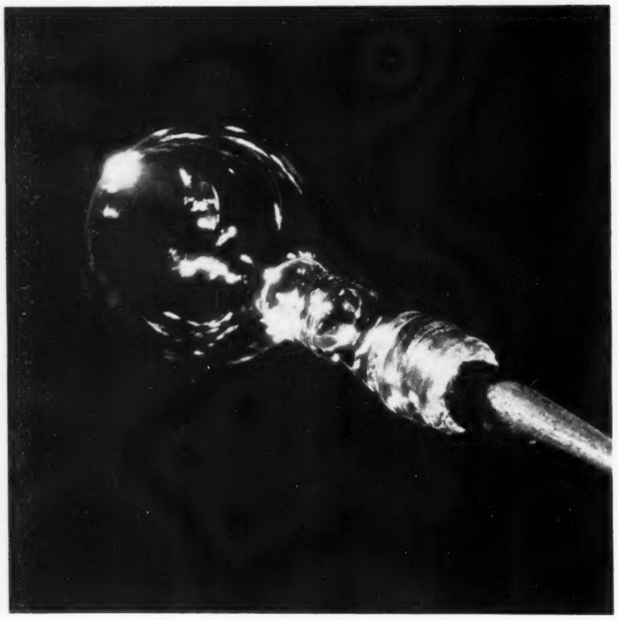
TRADITIONALLY, the chemical reaction begins in the test tube, and thus all chemical manufacturing is at the outset served by glass. Materially, there is nothing more characteristic of research than chemical glassware, but in recent times glass has expanded its field of service, as a material of construction, to include the equipment of the plant itself. In step with the American chemical industry, from test tube to tank car, the rôle of glass in the manufacture of chemicals has advanced from the laboratory test tube of chemistry to include miles of pipe line and tons of chemical engineering unit process equipment.

The evolution of glass in terms of the work of the chemist and chemical engineer is an absorbing story which can be told more clearly by reference to its background. From the founding of this country until the time of the Civil War, the domestic production of apparatus for the laboratory was so limited that it could scarcely be called an industry. Not until the World War, when scientific supplies could no longer be imported from Germany, did the apparatus industry in America get its real start. The relative part played by the Corning Glass Works throughout its long history can best be understood by reference to the origin and evolution of glassmaking in America.

The first industry in America was the manufacture of glass. In 1608, Captain John Smith established a glass factory at Jamestown, Virginia. Following this venture in glassmaking, a glass works was started at Salem, Massachusetts, in 1639. Similar glass enterprises followed in New York, Connecticut, Pennsylvania, and Maryland. During the three centuries after its founding in America, the glass industry was essentially rule of thumb and manual in process. It had been so for many centuries before. Gradually some improvements in chemical technology were reflected in purer batch materials and an increasing knowledge of fuel technology brought the industry greater efficiency in the melting processes. While some relations had been established between the chemical composition of glasses and their optical and physical properties, the glass industry at the beginning of the Twentieth Century was an art. The industrial practices of this art, founded on centuries of experience, were to provide a fertile field for coordination by the scientist and engineer. Today the glass industry has emerged from the



Above, blowing a retort. Laboratory items like this will probably always be a lamp room hand blowing output by master craftsmen. Top, left, testing a rib in the world's largest piece of glass; the 200-inch, 20-ton reflecting telescope mirror disc.



ages of closely guarded secret formulas and empirical processes to a full use of all of the tools of modern research science.

The Houghtons, Industrial Pioneers—Corning

In 1851, at Somerville, Mass., Amory Houghton, Sr., founded the Union Glass Company. Here was established a laboratory devoted to experimental glassmaking. In 1864, the Houghtons, father and son, sold their first plant and became interested in the Brooklyn Flint Glass Works in Brooklyn, New York. In 1868, the equipment of this plant was moved to Corning, New York, and a new firm was organized as the Corning Flint Glass Company. In 1875, the company became the Corning Glass Works, and from this time its rise to a position of leadership was rapid. Many developments covering whole fields of American industry followed each other in quick succession.

The first notable Corning development was the adaptation of a copper ruby colored glass for the danger signals used by railroads. Hitherto such signals had been made of gold ruby glass, which, although giving a brilliant red light in clear weather, showed a much less intense signal when the weather was foggy. This characteristic constituted a real hazard and was the direct cause of rear end collisions. The copper ruby glass removed this hazard, as it gave a brilliant red signal in all weather. The welcome with which the railroads met the copper ruby glass brought fame to Corning Glass Works.

The second important development came in 1878 when Thomas A. Edison, realizing the need for a bubble of thin glass to enclose a filament and maintain a vacuum around it, asked Charles F. Houghton of the Corning Glass Works if his company could make the bubble. The first sample submitted had walls that proved to be too heavy, and Edison asked for lighter construction and a satisfactory sample was submitted. From this sample was blown the first commercial electric light bulb. Corning Glass Works began the manufacture of bulbs for an industry that was destined to become one of the largest in the world.

In about 1877, Charles F. Houghton had developed and patented a railroad lens which reversed the entire process of lens making. In Houghton's invention the corrugations were on the inside of the lens instead of on the outside where they had always been before.

The next great Corning development came in 1896 when Arthur A. Houghton, Sr., invented the method of making thermometer tubing by drawing the glass vertically. The previous method of horizontal drawing had caused a twisting of the lens. Soon followed the construction of the famous twelve-story thermometer tower where Corning thermometer tubing is now drawn. Meanwhile a complete study of the best glass colors for use in railroad lenses was undertaken, and a result was the adoption and standardization by all railroads in the country of the colors which this study revealed to be most satisfactory.

Success in signal lenses had a close relation to the influence which the company was to assert in the field of Pyrex laboratory glassware. Following the researches on signal lenses, the Corning Glass Works incorporated into its personnel a group of chemists and physicists and established a research laboratory. Corning still wished to produce a glass with such heat resisting qualities that it would not break under the severe temperature changes to which lantern globes are subjected. Up to this time the greatest venture in the manufacture of heat resisting glass had been made by Schott and Genossen of Jena, Germany.

Heat Resisting Glass, Mechanically Strong—"Pyrex"

The first glassware developed by Corning experiments was applied to railroad lantern globes in commercial quantities toward the end of the year 1908. This glass, however, lacked the high degree of chemical stability which was desired. It was not until several years later that high heat resistance coupled with high chemical stability was achieved. This line of experimentation led to ramified research activities, and resulted in the development by Corning Glass Works of one of the foremost glass laboratories and a comprehensive knowledge of technical glassmaking, linking the art of the past with the science of the present.

About 1915, the development of heat resisting glasses had progressed sufficiently for their adaptation to many products of widely diverse utility. The unique application of glass in domestic baking was made possible only by the use of these new glasses. As a result, Pyrex ovenware has become known throughout the world. Immediately following the manufacture of Pyrex ovenware came the manufacture of Pyrex laboratory glassware. Prior to the World War, much laboratory glass used in chemical laboratories was imported from Jena, Germany. When the war put a stop to this importation, a shortage of chemical glassware

resulted, which would have seriously curtailed the American chemical industry at this crucial time, had not Corning come forward with Pyrex laboratory ware with its unique combination of mechanical strength and resistance to thermal shock. Tests conducted by the United States Bureau of Standards proved Pyrex laboratory glassware superior to that which had come from Germany. While the importance of this contribution during war time can scarcely be estimated, it laid the foundation for American industrial triumph during the ensuing years of peace.

Broken glassware means waste and expense in equipment, chemicals and time. Such expense is now largely eliminated through the universal adoption of Pyrex brand glass. Beakers containing cold liquids can be heated over the Bunsen Burner; stirring rods can be properly used without fear of the ominous clink and splash which ruined any analysis in the old thin-walled glassware. Test tubes can now be regarded as relatively permanent equipment and the same holds true for flasks, retorts, condensers, extractors, cylinders, funnels, petri dishes, and the whole range of laboratory glassware. Pyrex brand laboratory glass has the lowest coefficient of expansion of any commercial glass—0.0000032, which makes it unequalled in its ability to withstand sudden temperature changes. Because of this fact, it is possible to use heavier and therefore stronger construction to resist breakage. Then too, its chemical constitution makes it resist the attack of even powerful chemicals thus protecting the purity of solutions. Resulting economy and convenience to the chemist need no elaboration.

The step from laboratory to plant has always found the latter not only a transition in size of operation but in the material of its equipment. Although practically all laboratory work is done in glass, there had been but little use of glass in the same sense in the chemical factory. In the laboratory, reactions can be observed because of the transparency of the medium in which they are carried out. So, too, the cleanliness of the apparatus can be ascertained instantly and the effectivity of the chemical reaction determined by visual inspection. Until recently, however, plant scale operations enjoyed no such facilities because they were carried out in equipment of metal. Traditionally, the chemical engineer's unit process equipment was made of metal or of other opaque materials of construction.

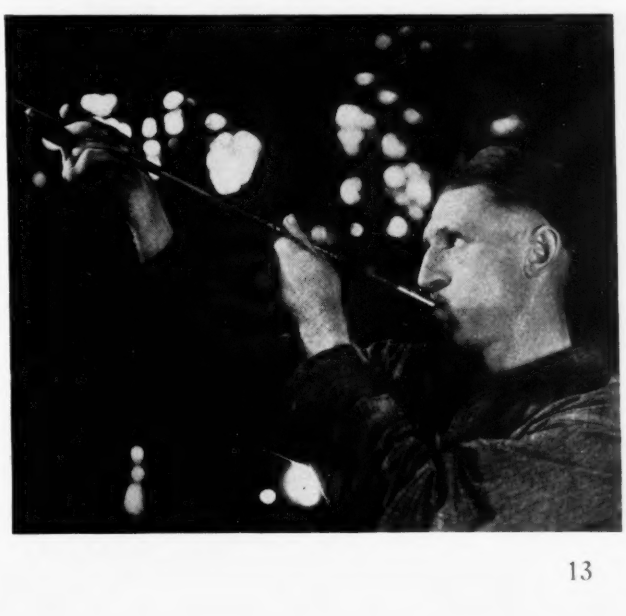
From test tube to tank car is an interesting significance. Underlying it are the experiments in miniature, in glass, in the laboratory; then, test runs in pilot plants; finally, the perfected processes on full plant scale production in every branch of industry throughout the world. In this sequence the pilot plant is a most important factor. It carries the test tube stage to an intermediate point with respect to quantities of material involved, and it is the stage at which the economics of many processes from a production standpoint are predicted.

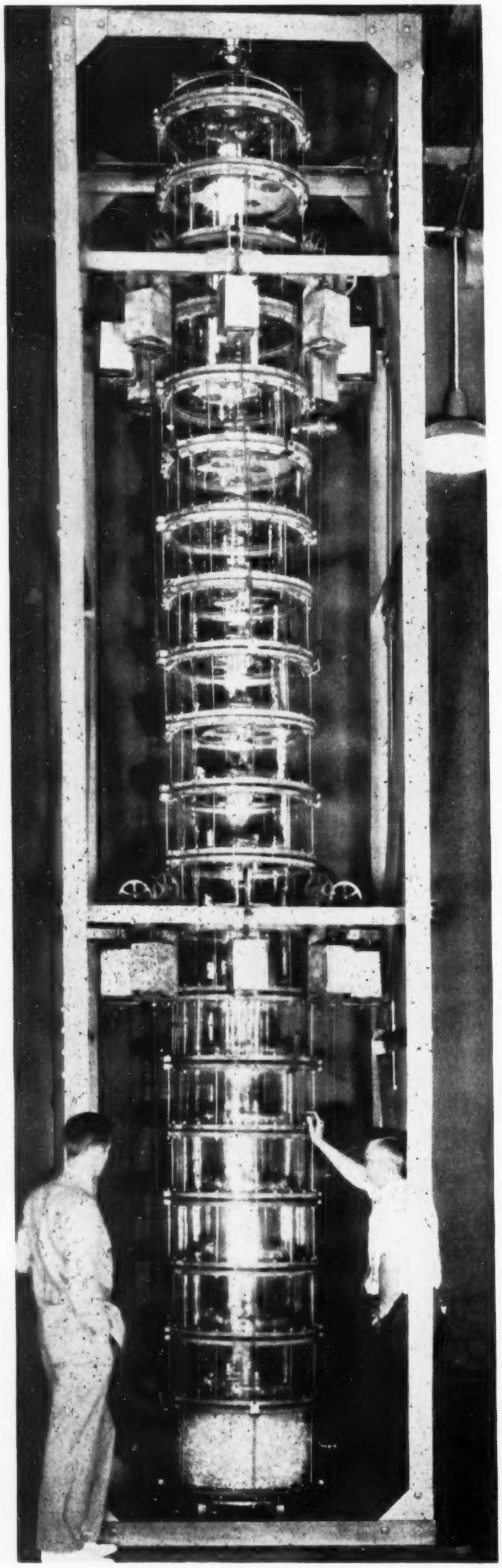
The outstanding advantages of glass for pilot plant construction are its inertness, durability, transparency and cleanliness. The new low-expansion glasses have extended the field through providing high heat resistance and durability under conditions of temperature variation or thermal shock. Chemically speaking, glass has moved forward from the status of laboratory ware to become a prevailing material for pilot plant construction. It has also taken a further step which has brought it into the realm of full-scale plant production as a material for chemical engineering unit process equipment and pipe lines.

Plant Pipe Lines of Glass!

"Make your production lines one continuous test tube" was for many years a thought to conjure with; but now it is a reality. Corning has taken a step beyond the manufacture of heat and chemical resistant glass for the laboratory and has opened an era in which even large chemical plant production is now put on a visual inspection basis. In one plant alone, more than 18 miles of Pyrex piping has given satisfactory service over a period of years. *Socket pipe*, in six inch and twelve inch diameters is now being used for processes in which the factors of cleanliness and sterilization, observation of liquid clarity, low friction loss, resistance to thermal changes, and freedom from corrosion are cardinal requirements. This glass pipe has now been used for several years for the handling of acids and a wide variety of chemical solutions. It has been used extensively for the construction of heat exchangers, both of the jacketed and surface or evaporation types. Elbows, Y's, Tees, and U's are also available. Such installations are of special advantage to the food and beverage fields, no less than to chemical manufacture.

Glass as a material of construction for the plant units of chemical engineering processes is also recognized. Among the interesting installations is a 20-foot rectifying column. In this assembly, which weighs about two tons, every phase of the fractionating sequence is visible for constant inspection. Cylinder sections, plates, and bubble caps are all made of glass,





likewise the ¾-inch glass bolts which hold them in place. Such a tower may be built up of any number of sections and provides for the continuous distillation of two or three-component mixtures of liquids of different boiling points, permitting the recovery of one or more products which have been associated as a physical mixture.

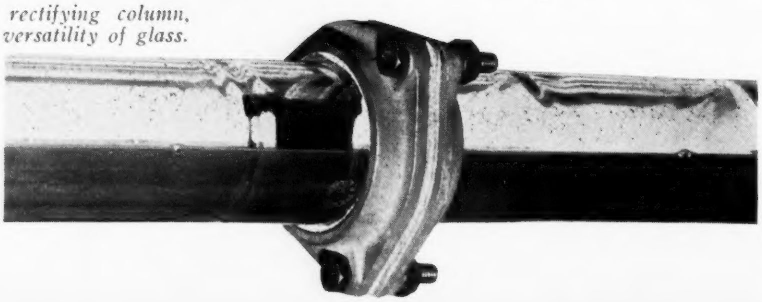
Corning Glass Works provides a most interesting picture of the combined practices of hand and machine operation. Thermometer tubing requires the work of skilled operatives, but the actual drawing, according to the vertical method, is done by machine. Standard electric light bulbs are made by machine but the larger sizes and special varieties for radio use are blown by skilled glass blowers. Railroad signal lenses are formed in processes operated by hand. There are laboratory items such as Geissler Bulbs and Soxhlet Extractors which will probably always be a lamp room hand blowing output by master craftsmen. Modern chemical research frequently requires complicated experimental units which call for the ultimate skill of the specialist in glass blowing. Corning Glass Works, because of its facilities and experience, is frequently called upon to execute these individual creations involving multiple bulbs, enclosed coils and specially connected thistle tubes, and separatory funnels.

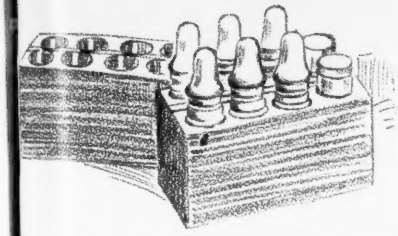
Some of the glass blowers at Corning rely on the continuous experience of more than a score of years at their craft. At the same time, in recognition of the economies which can result from mass production, many steps have been taken to secure rapid automatic production of such items as tubing, test tubes, and ampoules. Mass production of such items means lessened cost and their availability to more people. Another result is to conserve the handcraft skill of experienced men for the more interesting and ingenious manipulations in the art of the flame.

Advances in glass technology, especially since the World War, have led to the expansion of the American market to all corners of the world. Corning research and development laboratories have enjoyed broad coordination with every field of science and industry, and the organization has been permitted to serve in the solving of many difficult technical glass problems such as for instance the construction of a low expansion 200-inch, 20-ton reflecting telescope mirror disc.

The versatility of their experience enables the laboratories to establish a broad attack on any specialized problem. By scientific treatment of every new glass problem that has arisen over a long period of years, many new glasses have been developed to possess properties never before available. Countless comforts and safeguards have been given to present-day civilization in terms of glass.

Above, a 20-foot rectifying column, an example of the versatility of glass. Right, pipe lines of glass meet the requirements of the dairy, food, and beverage industries.

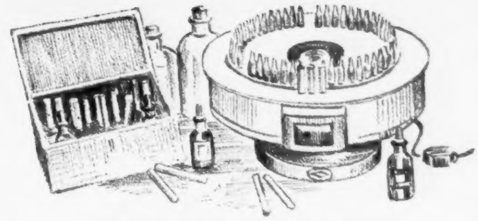




Original LaMotte pH Set.

The Romance of pH

A Notable Contribution to the Progress of Science



Improved LaMotte Roulette Comparator.

ACCURATE measurement and control make possible modern chemical mass production and the substitution of chemical for mechanical operations in many important industries.

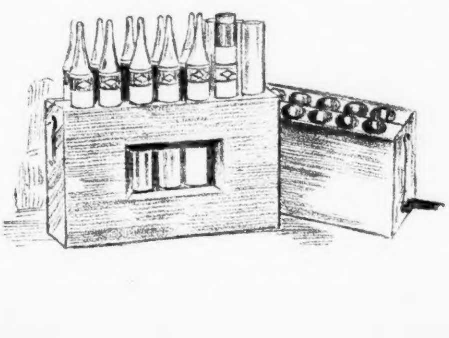
A little less than twenty years ago, on a side street of Baltimore, a young Johns Hopkins man, Frank L. LaMotte, began work in developing apparatus that would make possible the practical application of the highly scientific and valuable work of Dr. William Mansfield Clark and Dr. Herbert A. Lubs on hydrogen ion measurement. The first pH unit fashioned by this pioneer ended all untutored guess work, and saved much time-consuming laboratory labor, in the careful adjustment of alkalinity and acidity. A simple, accurate determination of solution reaction, as usable by the "bottle boy" as by the director of research, is rightfully included in that very short list of revolutionary contributions to true scientific chemical control.

Pioneering with "pH"

The first three years of effort were discouraging, for the term "pH" confused many technical workers. Through the instructive articles of such outstanding men as Dr. Clark, and Dr. Lubs, and the extensive educational publications gotten out by LaMotte, this condition was overcome, and the true significance of the discovery soon became appreciated in every sphere.

Personal interest and endeavor has characterized the collaborative work of more than one hundred prominent technologists and the LaMotte laboratory. Out of this cooperative spirit have come refinements and new applications that have revolutionized in a few short years the entire complexion of many industrial processes and revamped the approach to certain medical problems of highest importance to humanity. All manner of substances of varied physical characteristics have been submitted, and a LaMotte Method has been devised to meet each problem.

New ideas conceived in many laboratories, plants and hospitals were worked upon and perfected by the LaMotte organization, and given to the world in the form of pioneering apparatus and reagents. Rapidly, once the basic idea had been accepted, the control requirements in scores of growing process industries became apparent. In a word, the pressing need in all such fields was for a method providing simple, accurate, and scientific control by workers in the plant as well as by chemists in the laboratory. Frills and expensive accessories, of no aid to the practical worker, have found no place in LaMotte test methods, over which an everlasting vigilance has been practiced in the maintenance of highest quality and greatest practicability.



Original LaMotte Block Comparator

Today LaMotte pH control methods cover almost every requirement in chemistry, bacteriology, biology, agronomy, biochemistry, pathology, medicine, surgery and allied sciences. LaMotte has provided accurate and practical tests for the workers in all these fields and maintains cooperative service which functions to the benefit of the users of this equipment.

Industry's need is still more closely to control those factors entering into the basic chemical operations and to control their reactions by reliable and economic means. To the furtherance of this aim, the LaMotte organization, still directed by the same individual who, with his own hands, fashioned the first pioneering expression of Hydrogen-Ion control, is working. He and his co-workers always welcome the opportunity to collaborate with research men, just as they have worked shoulder to shoulder with scores of individual investigators in the past.

Meeting the Needs of "Today"

No useful purpose would be served by a detailed, chronological history of the apparatus developed since 1919. As an indication of the service rendered the cause of better control it might be mentioned that LaMotte apparatus is available for determining the pH of such substances as latex, sulfonated oils, inks, gelatines, milk, etc., wherein all difficulty due to high viscosity, color, or turbidity has been met and overcome. In a comparatively short time, LaMotte developments have spread and ramified amazingly, reaching out into all the process industries and affecting their operations in definitely advantageous ways.

Today the name LaMotte and the term pH are virtually synonymous in the minds of technical men. To think of one is to think of the other. To dissociate them is impossible. That this is literally true, is indicated by the fact that not a day goes by but that the LaMotte Research Department receives requests for pH studies in connection with new processes or operations. In complying with these requests, the LaMotte organization is contributing a type of service which has placed it in a unique position of regard and trust.

The Scientific Approach to the Container Problem

Of Equal Importance to the Adoption of a Workable Process and the Selection of Proper Equipment is the Choice of the Correct Container

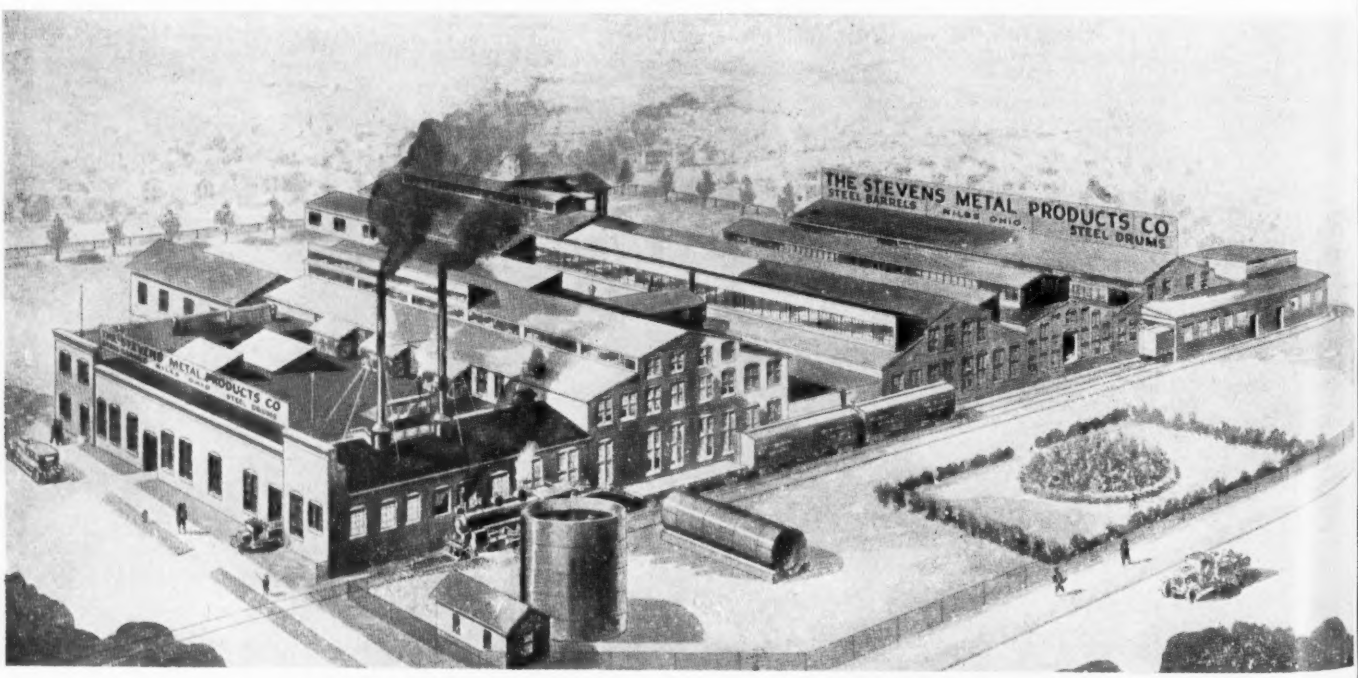
THE production of steel drums in this country, we believe, was started at about the turn of this century although no accurate records to substantiate this statement are at hand at this time. Prior to that time, such metal shipping containers as were in service in the United States were imported from Germany and Belgium. These were of the riveted type of crude construction, excessively heavy and with the chance of loss from leakage always present. The high cost of manufacturing a container of this type justified its use only as a returnable package, incurring prohibitive freight rates on the original shipment as well as the return of the empty drum. It is true that there are thousands and thousands of returnable steel barrels and drums in service today required by the rapidly expanding chemical industry, but they are being manufactured at a cost commensurate with the trend of today, and with the advent of highly developed welding practice the unit weight has been greatly reduced.

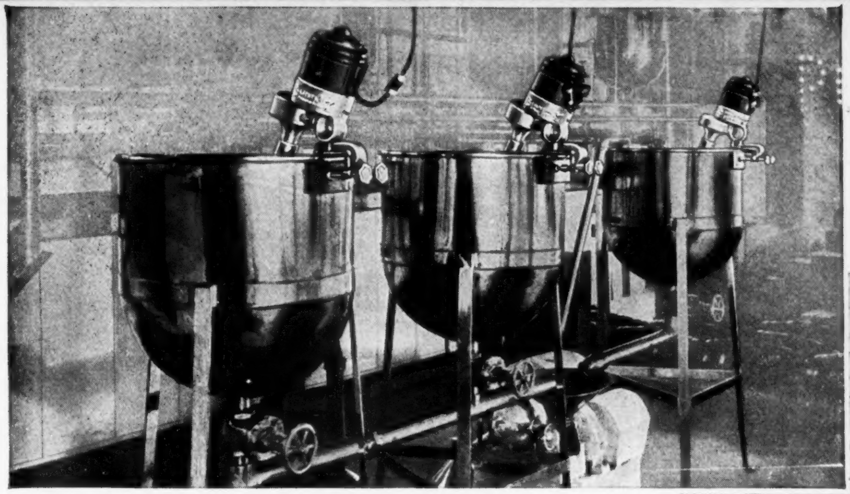
Early in the nineteen hundreds the first light gauge drum, which was destined to supplant the wooden barrel for the transportation of petroleum products, was made, and it was for the manufacture of this 18-gauge drum that The Stevens Metal Products Company was organized and incorporated in 1916. The first plant occupied one small building with floor space of 10,000 square feet on the banks of the Mahoning River in Niles, Ohio, and through the untiring efforts of E. D. Thompson, Vice President and General Manager, heading a competent organization, this modest beginning has grown into several buildings with a combined floor space of over 200,000 square feet.

In the last decade countless fields for the use of steel drums and barrels have been developed, and The Stevens Metal Products Company has contributed greatly to this development. In 1928, The Stevens Metal Products Company acquired the Detroit Steel Barrel Company of Toledo, Ohio, and the patents, trade names and good will, which it had created. In order to bring this manufacturing unit closer to its source of supply and to further diversify the products of the parent company, the Detroit plant was moved to Niles in 1932. With this acquisition, Stevens has been able to meet the varied demands for heavy and light weight packages in both tight head and removable cover type.

One of the more recent contributions of definite importance to the chemical industry made by Stevens is stainless steel drums and bilge barrels. New applications for stainless steel containers are being unearthed daily, and their adaptability to specific uses where discoloration or corrosion is encountered remains unchallenged.

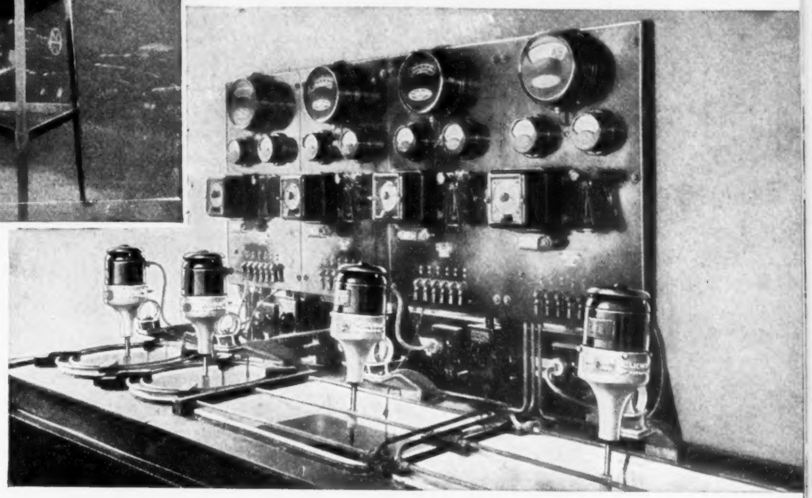
Realizing that steel barrels and drums are closely allied with the chemical industry, The Stevens Metal Products Company has been ever alert to this obligation for research and for the development of containers that will help solve its shipping and storage problems.





Left, a group of three "Lightnin" Geared Drive Mixers in operation.

Below, a battery of four "Lightnin" Direct Drive Mixers in use.



Seventeen Years of Advanced Methods in Mixing

DESPITE the widespread use and importance of mixing in many phases of industry, it remained for F. L. Craddock to invent the first electric portable mixer in the late year of 1918. Today the Mixing Equipment Company, Inc., is the world's largest manufacturer of this type of equipment, made under the trade name of "Lightnin" Mixers and Agitators.

The actual granting of patents was preceded by several years of intense study of all types of mixing operations, and led to the development of what is now known as the "Lightnin" Mixing Method. It introduces a double action best described as a slow rotation plus a rapid bottom to top turn-over. This action is accomplished by placing the propeller shaft downward at an angle and locating it Off-Center. The downward thrust at an angle directs the force to the tank bottom where it actuates the settled material and the reflected force drives it to the top. Since the thrust is Off-Center, a rotation is set-up.

So efficient is this double action that "Lightnin" Mixers are being used successfully for emulsifying, standardizing, compounding, blending, suspension of solids, etc., throughout the process industries.

The portable feature permits a great economy of operation, since the mixer can be attached or removed in a matter of seconds, making it possible for one mixer to service several tanks. Of equal importance is the fact that the development of a portable machine permitted mixing to be carried on in places and processes heretofore impossible. The resultant product improvement has been considerable.

To meet problems created by heavy liquids a geared drive type has been developed that has proved most successful. Various operating conditions have led to a wide variety of propellers.

So marked were the advantages of the portable type of Off-Center agitators that there arose an insistent demand for double action mixers for fixed installations on large processing tanks. This resulted in the development of "Lightnin" Angular Off-Center Propeller Type Agitators. The patented Angular Off-Center feature assures a positive directional flow, the propeller thrust driving a powerful Off-Center stream through the mix, setting up a slow rotation in combination with a fast bottom to top turn-over of the entire fluid body.

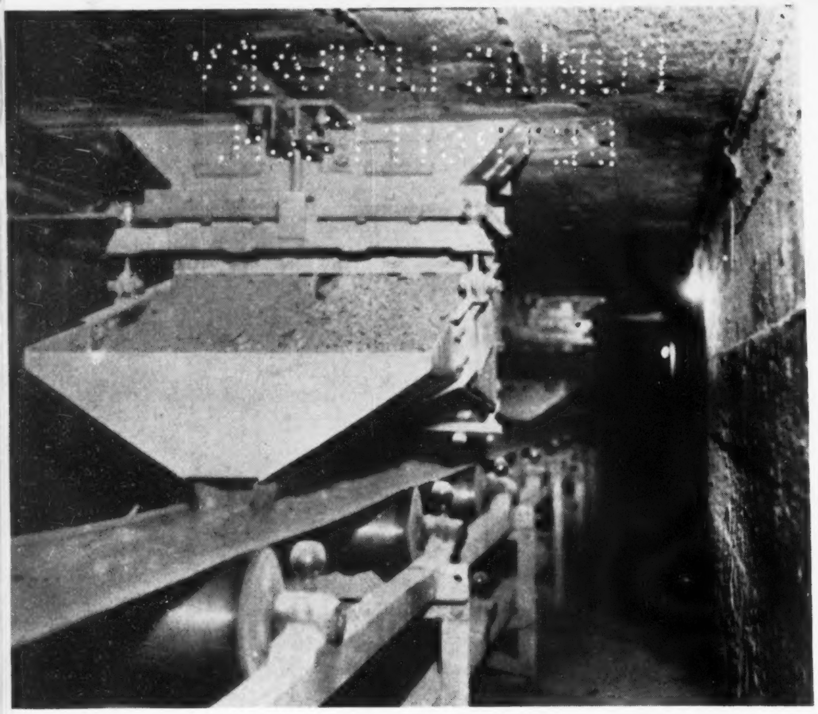
The latest development of this company is a continuous emulsifier for asphalt emulsions and similar products. This operates on a new principle, in that a unique arrangement of vertical and circular baffles in combination with high speed, perforated, saw tooth edge propellers, literally cuts the material to pieces.

Another popular use of "Lightnin" Mixers is for mixing, agitating and boosting in pipe lines. It has been found to speed up flow and prevent separation.

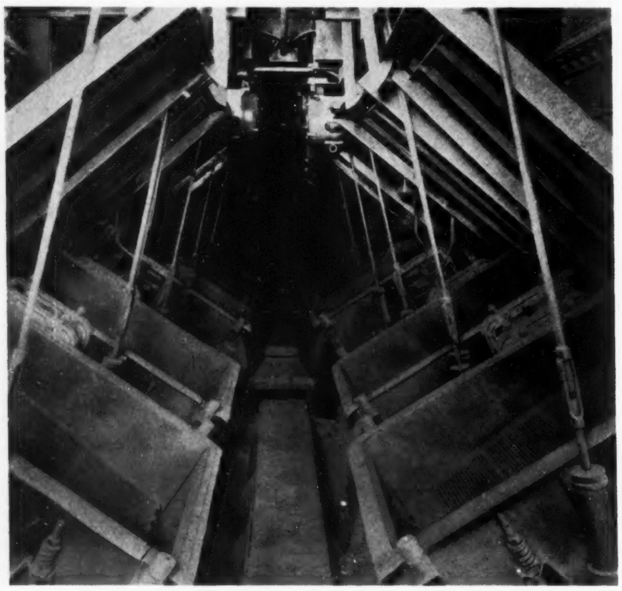
"Lightnin" Mixers are widely used in the chemical industry. Special metals and alloys for shafts and propellers permit their use with a great variety of corrosive products. The same efficient results may now be had in closed tanks for air-tight, pressure or vacuum work, by the newly designed adapter fittings for all standard models.

The company's home office and modern equipped factory are located in Rochester, New York, with branch offices in New York City and Chicago, and having representatives in all principal cities.

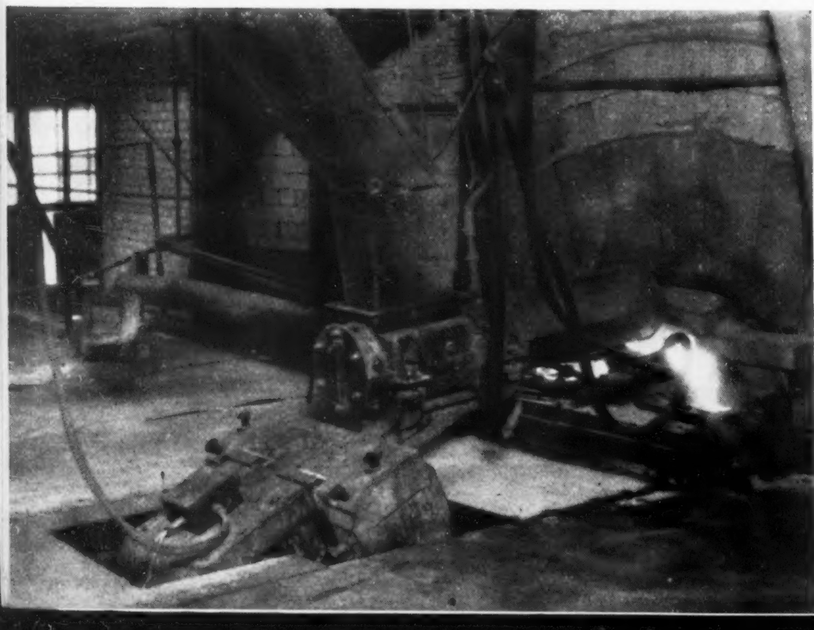
The company maintains a modern research and engineering department to aid its customers in solving their mixing problems in a more modern and economical way.



A battery of proportioning pan feeders delivering from a six-compartment silo in a cement plant. By giving accuracy of feed, these vibrators assure close control of the mix.



A battery of 24 vibrating screens in closed circuit with crushing rolls. The electric vibrating principle is peculiarly adapted to sizing, scalping, bypassing, rescreening and dedusting.



Vibration Power—

IT all began in Old Mexico twenty-two years ago, when a mining man of our West experienced his first earthquake. Though the tremors caused no great damage, they did dislodge sizable chunks of adobe from native huts. Yet there was no perceptible movement of the dwellings.

With the secret of the tremors—high frequency vibration—he was, of course, familiar. If only vibration could be induced and controlled, he pondered, what ideal motive power would be made available for handling materials in the processes of industry! With this his dream, the man set out with others to develop the idea behind it.

By 1926, the new kind of motive power became an accomplished fact. The first industrial application, the screening of ore, proved eminently successful. A method finally had been devised of generating, harnessing and putting vibration usefully to work.

So emerged the Jeffrey-Traylor patented all-electric vibrating equipment, which, in the chemical and other industries during the last ten years, has been adapted to feeding, conveying, screening, packing, cooling, dewatering, drying, weighing, inspecting and other related unit operations. Jeffrey-Traylor is a division of the Jeffrey Manufacturing Company, of Columbus, Ohio, which was founded in 1877, and whose business is the manufacture of both material-handling and mining machinery.

Vibration is transmitted direct, the handling deck being attached as an integral part of the power unit. This last may be thought of as an electro-magnet, but actually it is a straight-line reciprocating motor. The deck is attached to the oscillating keeper (or armature) and both ride on vibrator bars held by a heavy main frame. Fixed to the main frame is the magnet (or stator).

Depending upon the frequency and intensity of vibration needed, the units are energized by alternating current, by "mixed current" (direct current superimposed on alternating current), or by both in separate "push-pull" circuits. The electrical impulses create a series of interrupted magnetic pulls. Opposing these pulls is the restoring force of the vibrator bars, which causes the armature and deck to snap away from the magnet with each interruption of current. Thus, the vibrator bars keep the armature from coming in actual contact with the magnet and prevent rapping noise and mechanical shock.

The equipment has demonstrated that under the im-

Left, continuous feeding of batch to a glass furnace. Being water-jacketed and having no moving parts, the unit requires no lubrication, and so will operate at peak efficiency under high temperatures.

A Boon to Processing

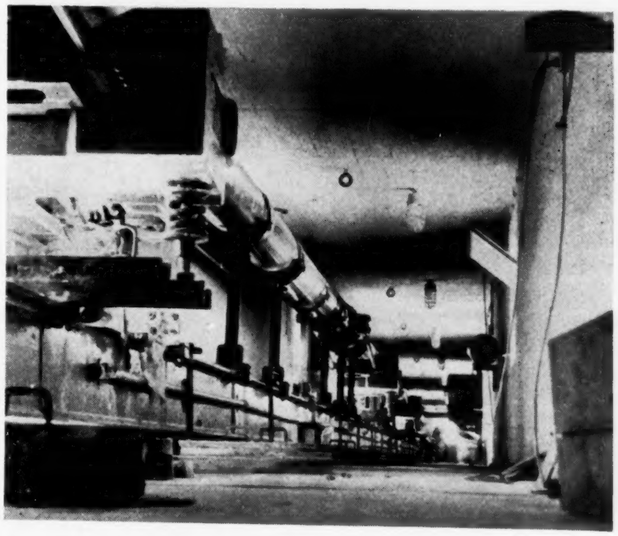
pulse of nothing more than vibration power, it is perfectly feasible to convey solids gently over the smooth bottom of open troughs or in tubes, over long distances and short, horizontally, down grade, and—within the limits of gravitation—even uphill. This is accomplished with no visible movement of the carrying channel, so short is the stroke of vibration and so high its frequency—up to 7,200 strokes per minute. Indeed, only by feel with the hand is vibration of the deck manifest. Despite its seeming immobility, the equipment possesses great conveying capacity. Furthermore, the capacity can be instantly and accurately regulated to any rate between a widely separated maximum and minimum. The smallest units can be adjusted to deliver but a few pounds or several thousand pounds per hour. Largest units are handling well over a thousand tons per hour.

Material moves over the deck in a smooth flowing stream. The particles are projected from the deck in a continuous series of rapid forward hops similar to saw teeth in outline. And, as the hopping action keeps the material in suspension, there is no sliding contact with the deck. So abrasive wear is reduced to a minimum.

Accuracy and flexibility of control constitute only two of the many prime advantages offered by the equipment in addition to low power consumption. Having no mechanical wearing parts, the units require no lubrication and consequently may be operated under high surrounding temperatures. Because lubrication is unnecessary, contamination and discoloration of such easily spoiled products as sugar are avoided. The smooth surfaced channels and buoyed flow promote cleanliness, minimize degradation and avert loss of luster and brilliance to crystalline products. For the same reasons abrasives can be handled with less wear and tear. Simplicity of design permits sealing of the handling system. Sealing in turn aids temperature and moisture control and expedites cooling and drying processes.

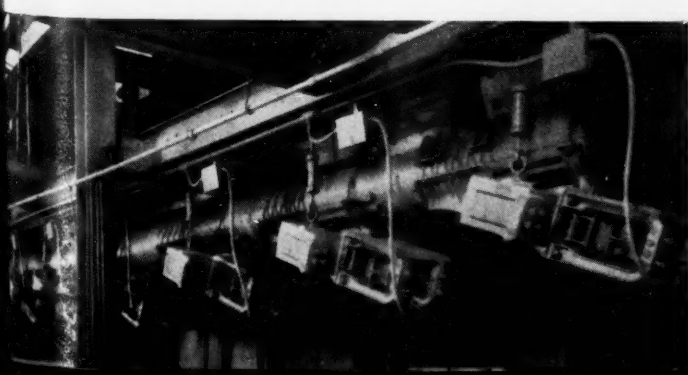
(Continued on next page)

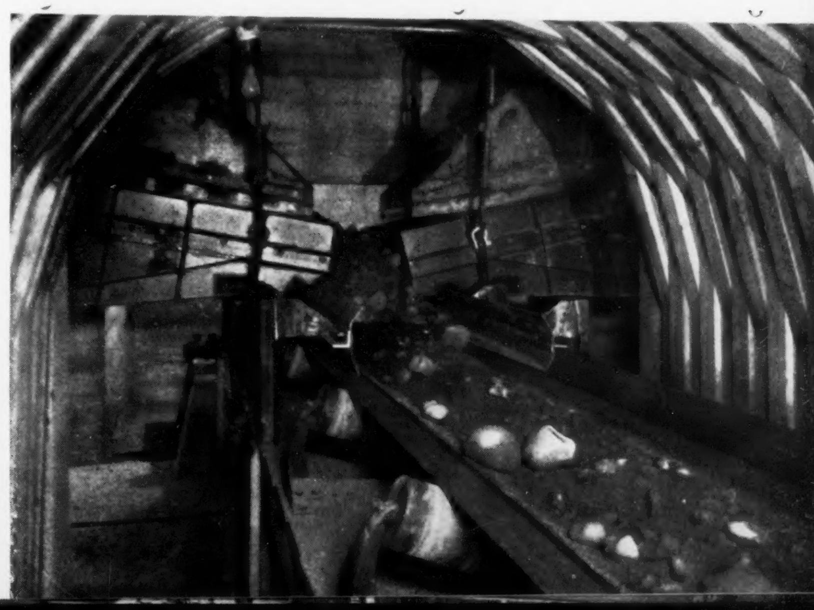
A 26-inch diameter vibrating tubular conveyor handling red-hot, gaseous lead sinters discharged from five sintering machines. The installation is completely sealed.



Vibrating tubular conveyor flowing various grades of sugar to silos at the rate of 30 tons per hour. This tube is 14 inches in diameter, 250 feet long and vibrated by five power units attached at 50-foot intervals.

Below, hung beneath iron-sintering machines, this 20-inch diameter, 60-foot long tubular conveyor discharges direct into a pug mill. Temperatures of the sinter run from 600° F. (normal) up to 1,100°. Right, two heavy duty pan feeders each discharging minus 16-inch sand and gravel at the rate of 1,250 tons per hour, and requiring but four horse-power.





Automatic feeding and weighing at a steel operation. The material is mine-run coal.

Flexibility of application is gained by attaching the power units singly and in multiple to various kinds, shapes and sizes of decks.

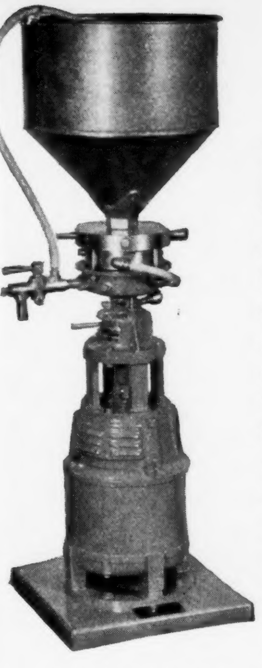
Hundreds of successful vibrator installations have already been made in chemical and drug plants; food plants and bakeries; mines, mills, smelters and foundries; construction jobs; laboratories; water works and sewage plants; glass plants; quarries and cement plants—wherever raw or processed or waste material is handled.

To date over 200 materials are being processed; in sizes of 3-foot cubes down to finest powders; of densities as high as 400 and as low as 6 pounds per cubic foot; with moisture indicated as wet, damp, sticky, or dry; in temperatures of 2,000 down to 32 degrees, Fahrenheit: Black powder, fertilizer, flue dust, salts, charcoal, sulfur, borax, acetates, carbide, arsenic, titanium dioxide, resin, plasters and cosmetic powders; cement, cinders, boulders, crushed stone, coal and coke, ores, sand and gravel, slag, sludges, sinters, calcines, fibrous materials, glass cullet and clay; sugar, chewing-gum pellets, cereals (grain and flakes), cocoa, starch and soap chips; nails, tacks, buttons, jewelry, and other small parts.

These vibrators have been combined with scale equipment for continuous and batch weighing and feeding; applied to the feeding of coal to pulverizers; handling of wet cut photographic films; screening of smokeless powder under water; cooling of soap chips; drying of table salt from filters; dewatering of Glauber's salt, cellulose acetate and wheat; packaging of corn flakes; shaking out of foundry flasks; spreading of small parts for inspection purpose; and screening of mud in rotary drilling of oil wells. A few other specific jobs are: Accurate weighing and feeding of input to plant, as basis for payment for raw materials and processing tax (under AAA), and for determination of spoilage loss, plant efficiency and final unit cost; feeding lime or chemicals into mixer tanks, etc.; continuous feeding of reverberatory and glass furnaces; feeding, screening, weighing and packing of "egg" potassium cyanide in a single combination process; sealing against escape of harmful dusts and gases; sealing against exposure of products to the atmosphere; and selective feeding of several materials to a series of bins, using but one (self-cleaning) vibrating deck.

Automatic batch-weighing of sugar beets at rate of 150 tons per hour in batches of 5,000 pounds.

Inexpensive Efficient Colloid Mills



New Eppenbach Temperature Control Colloid Mill

EPPENBACH, INC., has had a long and honorable history as developers of special automatic machinery. In 1915, Eppenbach engineers were asked to solve a colloid problem and promptly accepted it as they had hundreds of other routine special equipment contracts. Little did they suspect that they were making a major decision as to the future activities of the company. In the past twenty-one years, Eppenbach, Inc., has contributed notable service to the chemical and process industries through the manufacture of thirty types of colloid mills.

Through the expenditure of large sums for research, Eppenbach has developed machines to produce colloids without overheating, to require only reasonable power consumption, and to eliminate air to prevent oxidation. In the past, the mistake made was in attempting to reduce hard particles by employing high speeds which meant, under actual operating conditions, high power costs and damage because of overheating. Further, earlier efforts to construct one type of mill that would be a "Jack of all trades," had ended in failure and given colloid mills a "bad name." As specialists in colloidal equipment, Eppenbach engineers discovered and proved that high speeds was not the correct answer. They were the originators of various types of mills which embody the principle of very fine clearances, using pressure to force the material through the practically closed grinding and homogenizing gaps.

Frequently products are made in the laboratory but nothing but failure is encountered in the factory. Eppenbach colloid mills have supplied the solution in thousands of such situations. Chemists have come to learn that when their experiments are carried on with Eppenbach laboratory equipment identical results are assured in manufacture when larger colloid mill units are used.

Many products which were thought impractical to produce have been turned into profitable realities when colloidal equipment has been utilized, often as a last desperate resort. Subjecting many materials to high pressures and forcing them through fine clearances has produced many startling discoveries, in many cases imparting to the finished products new and revolutionary characteristics heretofore unsuspected.

Proper capsulizing of hard particles by means of violent mixing under pressure and actual grind is the answer to the problems of manufacture of many foods, pharmaceuticals, plastics; in paints, inks, enamels, etc.

The surface has only been scratched in applying mechanical means of producing superior finished products. The manufacture of intravenous injection materials, the reduction of glands for serums, the predigestion of vegetation for infant feeding, the finer paper coatings, leather finishes, and the reduction of all color particles are now possible by recent developments in Eppenbach colloid equipment. The application of Eppenbach mills for the manufacture of finer greases and in the coal tar industry for the manufacture of many valuable products, including colloidal fuel, is gaining rapidly. Hardly a beauty preparation is marketed that is not processed through special types of colloidal equipment developed by Eppenbach.

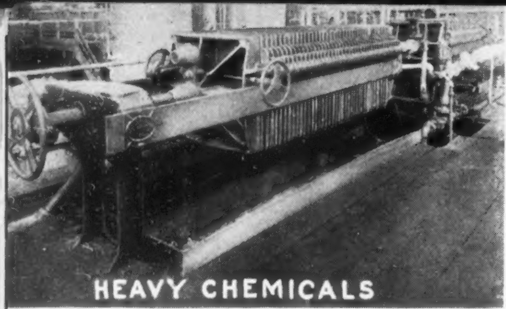
Many able chemists are handicapped by the lack of inexpensive colloidal laboratory equipment that would bring to the company profitable new lines and improve existing ones. A genuine laboratory colloid mill which can be used for a wide range of research, including the cutting of fibrous materials, grinding of hard particles and homogenizing, all with the same instrument, is a powerful stimulant to the chemist.

Eppenbach has contributed greatly to the advancement of industry by introducing a laboratory colloid mill at such a reasonable price that every laboratory can afford one, thus permitting chemists to experiment in their own plants rather than depending upon the colloid mill manufacturer to perform the work. This was a revolutionary departure from the practice in the colloid mill field, but time has proven the success of such procedure. This does not mean that Eppenbach engineers are not always glad to confer with manufacturers and to place at their disposal the valuable and varied experiences they possess, but it leaves most of the work in the hands of the men who are most likely to know the physical and chemical properties of the material in question.

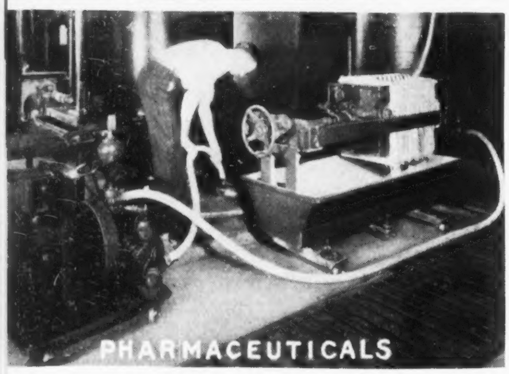
Eppenbach has developed pre-mixing apparatus which takes the place of the propeller and paddles to mix materials in a superior fashion and without incorporating the slightest amount of air. The line is portable, and can be placed in tanks without danger of the equipment damaging or vibrating glass-lined tanks.

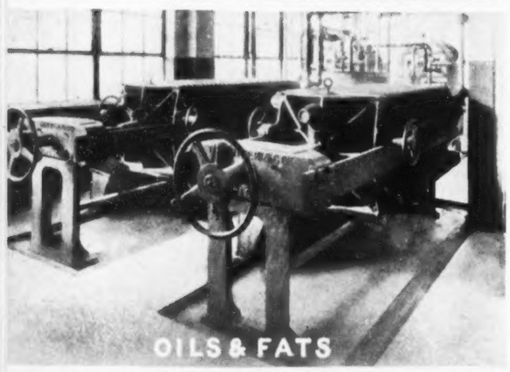
And now for a bit of prophecy. We are on the threshold of important developments whereby industry will turn to the farmer for raw materials. Eppenbach inexpensive laboratory colloid mills are going to play an important part for they will provide the chemist with the tool that will indicate the possibilities of many agricultural materials for industrial use. We believe that the Eppenbach mill will prove to be the connecting link between the chemist and the farmer in the farm chemurgic movement.

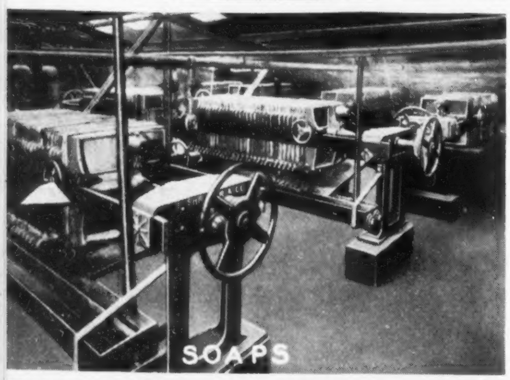
Colloid mills for introducing Vitamin D concentrate into foods.

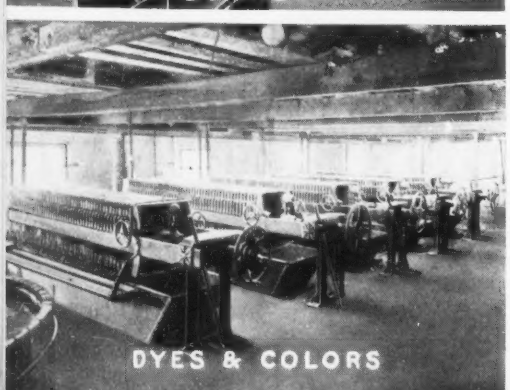

HEAVY CHEMICALS


FINE CHEMICALS


PHARMACEUTICALS


OILS & FATS


SOAPS


DYES & COLORS

Thirty Five Years of

The Story of Shriver Filter Presses

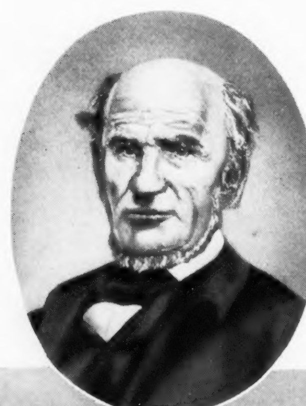
THE Shriver Company has been casting metals since 1860. In the early years the Shriver Foundry specialized in ornamental iron work. Later, the quality of work produced led to the use of Shriver cast piano plates by almost every leading piano manufacturer. Many an old grand piano still in use will be found to have a Shriver Plate.

The first Shriver plate and frame filter press was produced at the turn of the century, so that the Shriver Filter has been in existence during the entire period when the American process industries grew from modest beginnings to the imposing position they hold today. Keeping step with their needs, the Shriver Filter Press has been called upon to solve new prob ems of filtration as they developed, whether they concerned the recovery of solids, or the washing out of undesirable impurities, or the recovery of valuable solubles, or the vast field of clarification.

In the early days, filter presses were made either of cast iron or of wood. Today almost every conceivable material is used in Shriver Filters, from rubber to stainless steel; galvanized iron to chrome or nickel plated bronze; lead, aluminum and many other alloys.

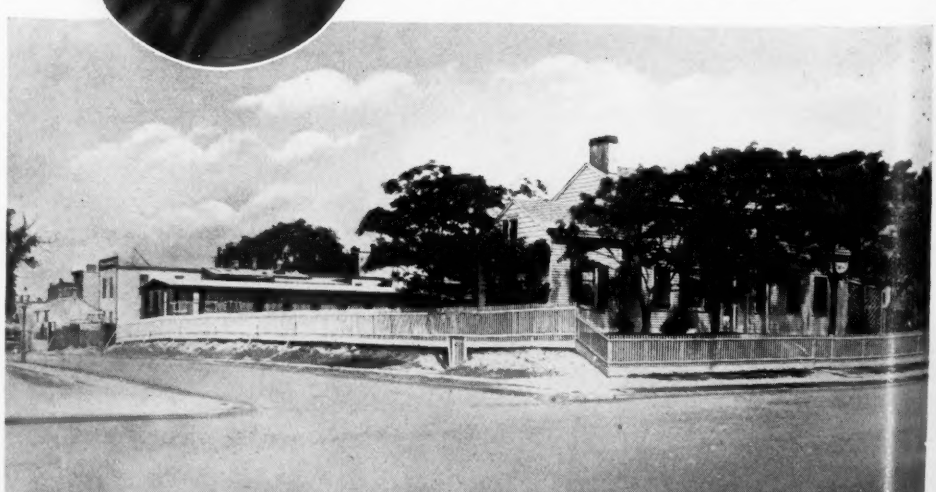
The story of Shriver Filters is one of constantly improved design and adaptation to specific filtering requirements. The common goal of any manufacturer of equipment—a completely standardized line—has never been reached by Shriver, because each individual installation involves special features which require specific modification of design or use. Of course, in any one field there is a range of tested equipment from which a type and size of filter press can be chosen to meet specific conditions, but complete standardization of plate and frame filter presses is neither possible nor desirable.

Most technical executives are thoroughly familiar with the uses of Shriver Filter Presses in their own industry. Few realize, however, the really tremendous range of applications of this type of filter. As a matter of fact, you can name almost any industry and be sure that in the plants of that field there will be from one to hundreds of these filters in daily service.



Thomas Shriver, inventor, designer and builder of roads and bridges; public servant and benefactor; founder of T. Shriver and Company.

The Shriver homestead in 1860 in upper Manhattan, New York, with the iron foundry located in the rear building.



Filtration Progress

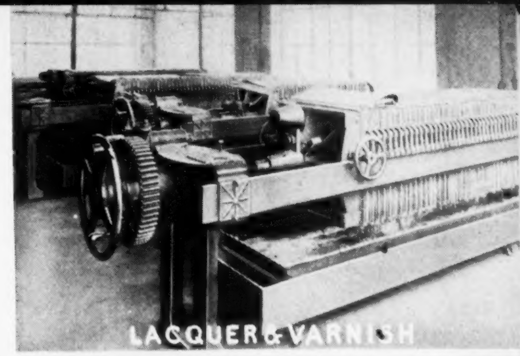
Among the process applications of these filters are many for out-of-the-ordinary services. For chemicals, colors, dyes, pigments, oils, fats, soaps, fertilizers, petroleum, pharmaceuticals, toilet preparations, rayon and the like, they are used for separation of solids and liquids, recovery of solids washed free of undesirable solubles; clarification of raw, intermediate or finished products; filtration at high or low temperatures and at extremely high pressures where necessary. For food products their performance is unmatched in clarification and polishing for high brilliance of wines, liquors, cider, vinegar, extracts, juices, syrups, etc., as well as in the recovery of such solids as casein, cocoa butter, preserves and yeast.

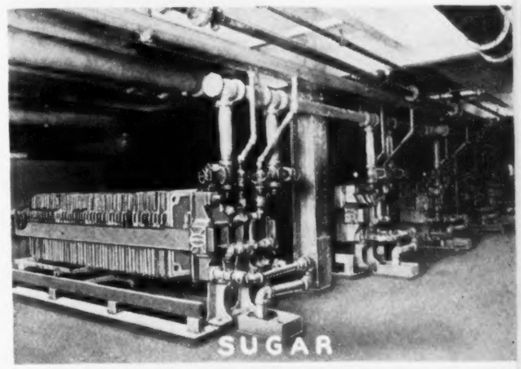
In the fields indicated above, as well as in numerous others, the Shriver Plate and Frame Pressure Filter has proven generally satisfactory in operating economy, installation cost and maintenance cost.

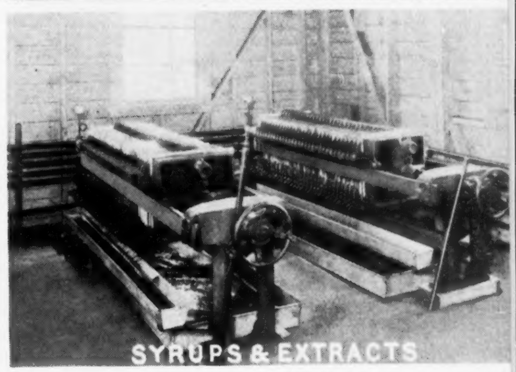
The task of keeping pace with the needs of America's Process Industries has given the Shriver Company an unusually broad fund of experience in filtration problems, which becomes more valuable every year.

This experience has been acquired not only through actual plant performance of the equipment, but through extensive testing and research into the products of clients in the Shriver Laboratory. Hence the history of the Shriver Filter Press is to a large extent the history of the Shriver Laboratory, which has been at the service of industry since the days when the first Shriver Filter Press was made.

Today this laboratory, fully equipped to meet the newest requirements, including facilities for filtration at high or low temperatures, is in greater use than ever. Scarcely a day passes when an engineer or chemist is not engaged, with Shriver research men, in solving some particular filtration problem. Literally thousands of these problems have been solved and as many thousands more will be solved in the Shriver Laboratory in the years to come.







Corner of Shriver laboratory, fully equipped for entire range of filtration research.

Shriver plant to-day, comprising extensive foundry, machine, woodworking and assembly shops, railroad siding, offices and laboratory.

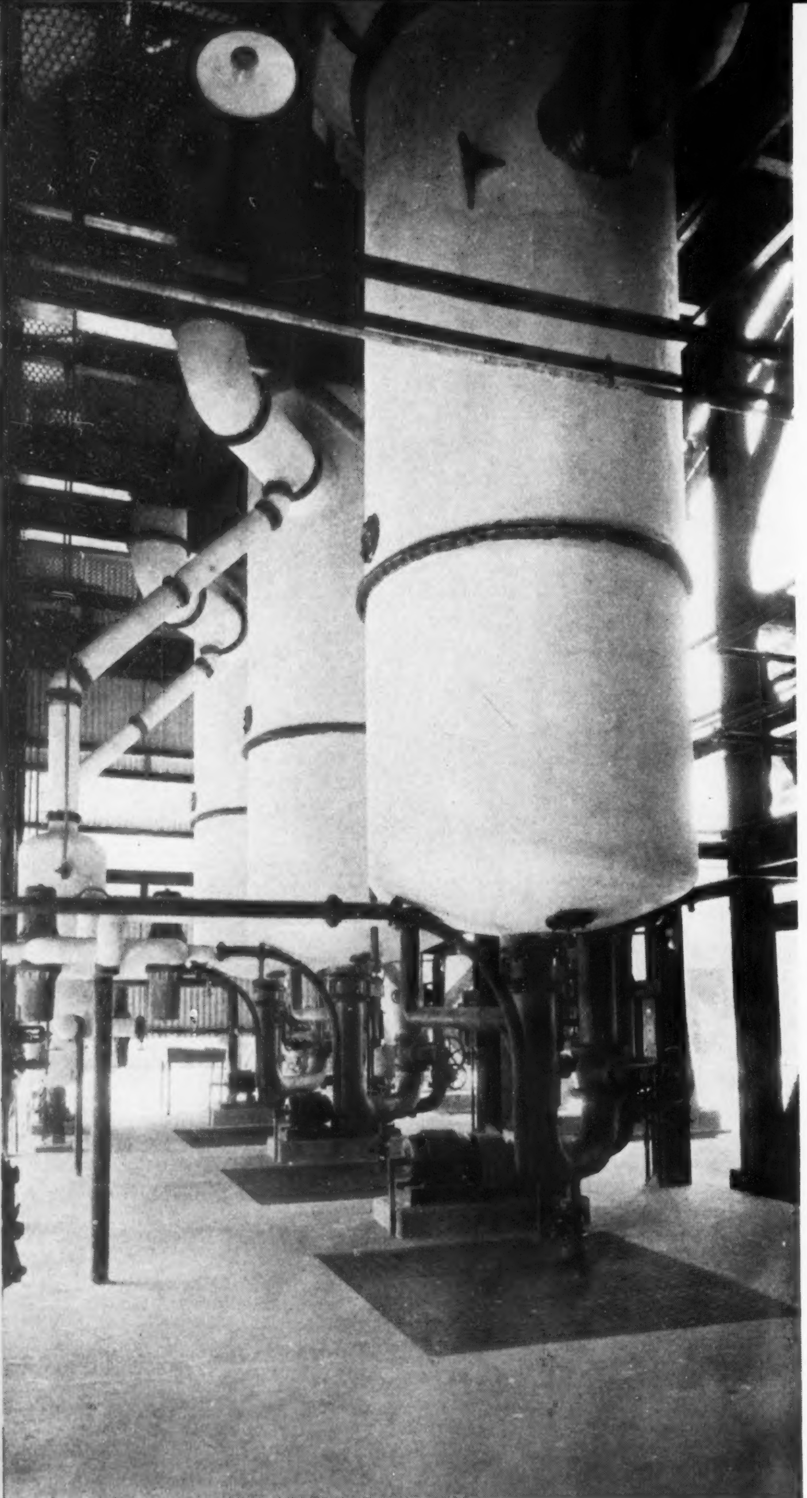
A Half Century of
EVAPORATOR PROGRESS

Swenson's Contribution to the Process Industries

SINCE 1889—when the name Swenson first became associated with the manufacture of evaporators—there have been very marked changes in equipment design as well as processes. Throughout the nineties and well into the new century, evaporators were mostly of the rectangular horizontal-tube type. The construction was mostly cast-iron with copper tubes.

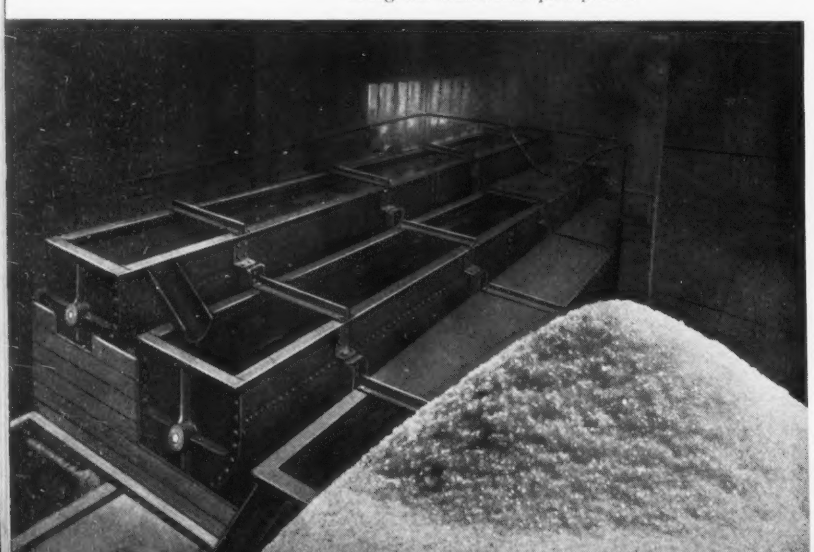
As the chemical industries flourished (especially since 1915) the need for bigger and better plants brought new demands upon the evaporator manufacturer. The horizontal type evaporator was in many instances replaced by basket and calandria machines. The greater variety of chemical substances being produced also stimulated the use of other materials; aluminum, glass, copper, lead, bronze, etc. Swenson was the first to make lead construction practical.

In 1924 Swenson led the way by adopting welded steel construction to replace riveted steel and castings. But the greatest progress has been made since 1925, when Swenson brought out its forced circulation evaporator. This design was probably the most forward step in evaporator history. One of its chief advantages, which has made it the standard for the alkali industry, is the relatively small heating surface required, allowing the use of high-priced materials for heating elements, such as pure nickel in the case of caustic soda,

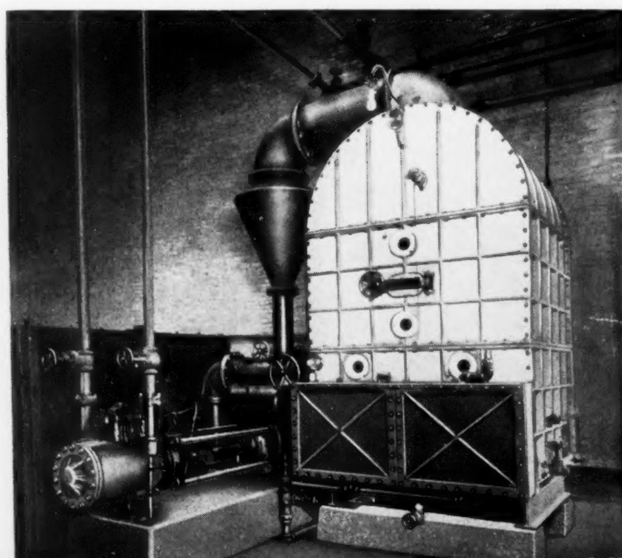


Above, a typical present-day Swenson evaporator of the long-tube film type.

Below, a 3-deck Swenson-Walker continuous crystallizer operating on trisodium phosphate.



One of the older horizontal evaporator installations. This one is of aluminum, handling gelatin.



and stainless steel for a variety of other applications, chiefly in paper mill evaporators.

The Swenson forced circulation evaporator has become, in a few years, the standard in the caustic soda field. It is also being used in other industries for handling corrosive liquor of high viscosity, high boiling point rise, and liquors that crystallize out salt in evaporator. Examples: electrolytic caustic, pulp mill black liquor, sodium sulfate, glycerine.

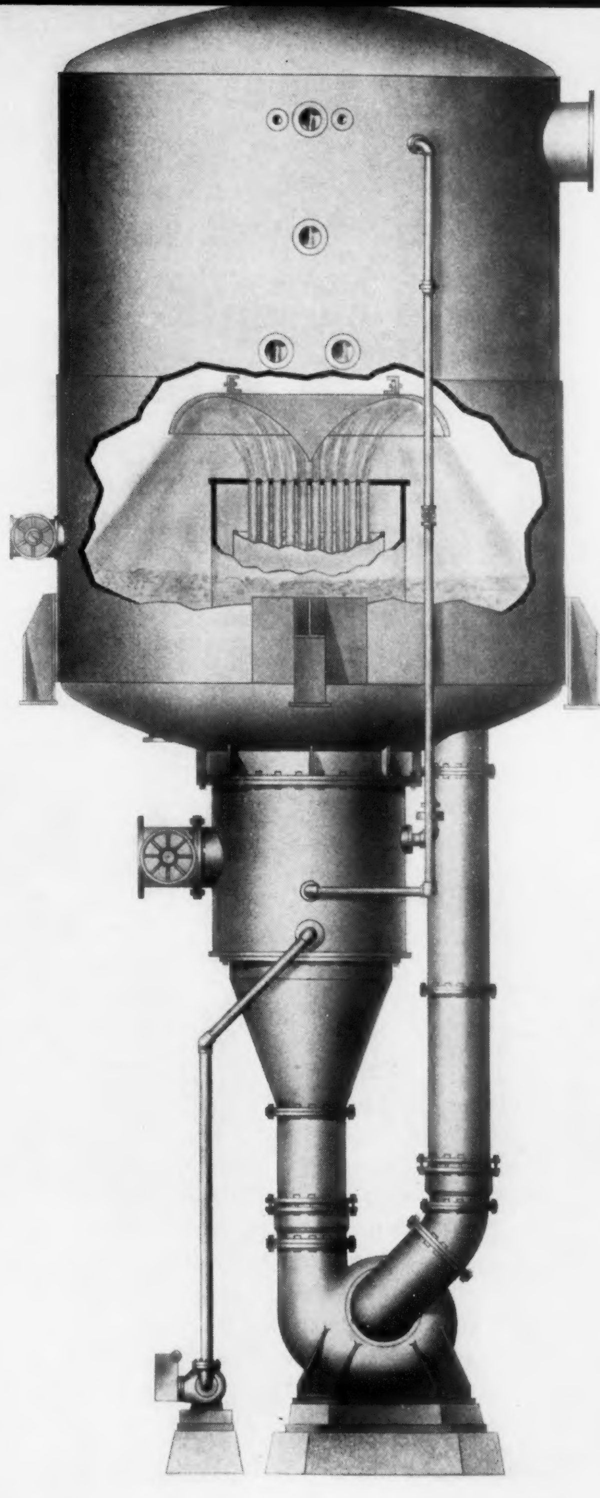
Another important Swenson contribution, first brought out in 1932, is the long-tube film type evaporator. This design, already well in use, has tremendously speeded up evaporator operation. It is practically free from entrainment and ideal for those concentration problems that involve foaming or viscosity.

It was a short step from evaporation problems to crystallization. In 1924 Swenson introduced the Swenson-Walker continuous type crystallizer. The instant success of this equipment was followed by a steadily growing demand for continuous crystallizing of many products, chief among them being trisodium phosphate, copperas, and salt from electrolytic caustic.

More recently, Swenson has developed a vacuum type of crystallizer which has opened the way for new and profitable methods of chemical recovery. The vacuum crystallizer is being used with much success on potassium chloride, Glauber's Salt, copperas and recovery of crystals from acid liquors. Its design permits the use of rubber-lined steel bodies for corrosive liquors.

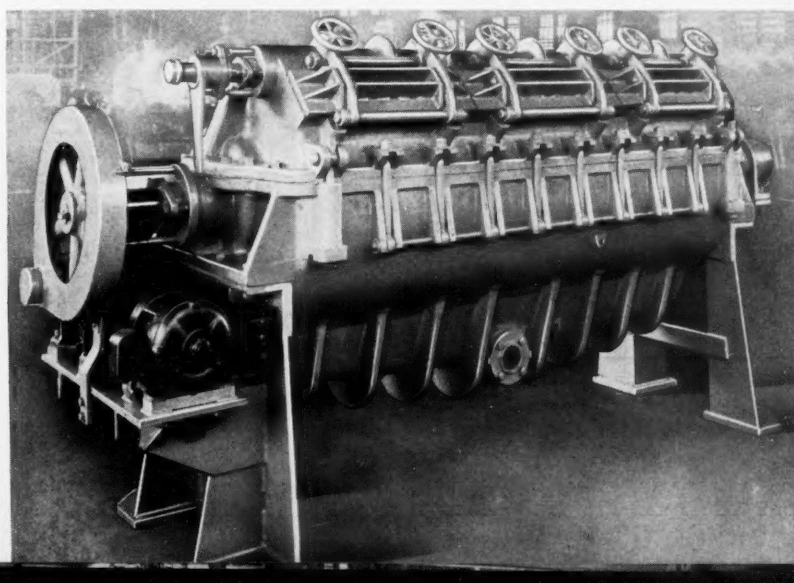
Swenson has at various times designed and built filtering equipment. In the last three years a special Filter Department has been organized under the direction of an experienced filter engineer, and a complete line of rotary vacuum as well as pressure leaf filters has been developed. Suitable designs are available for paper and pulp mills, for beet sugar mills, cane sugar refineries, oil refineries, chemical plants and for filtering sewage sludges.

Swenson service goes farther than the mere design and manufacture of an evaporator, crystallizer or filter. The practical knowledge gained by thoroughly following complete operation of each job in the field has been invaluable in the development of new ideas. Every step from the idea to the finished installation—research, engineering, manufacturing, installation, operation—is in the hands of experienced chemical engineers with the necessary practical knowledge resulting from years of actual service in the field. In this respect Swenson offers a unique service to the process industries.



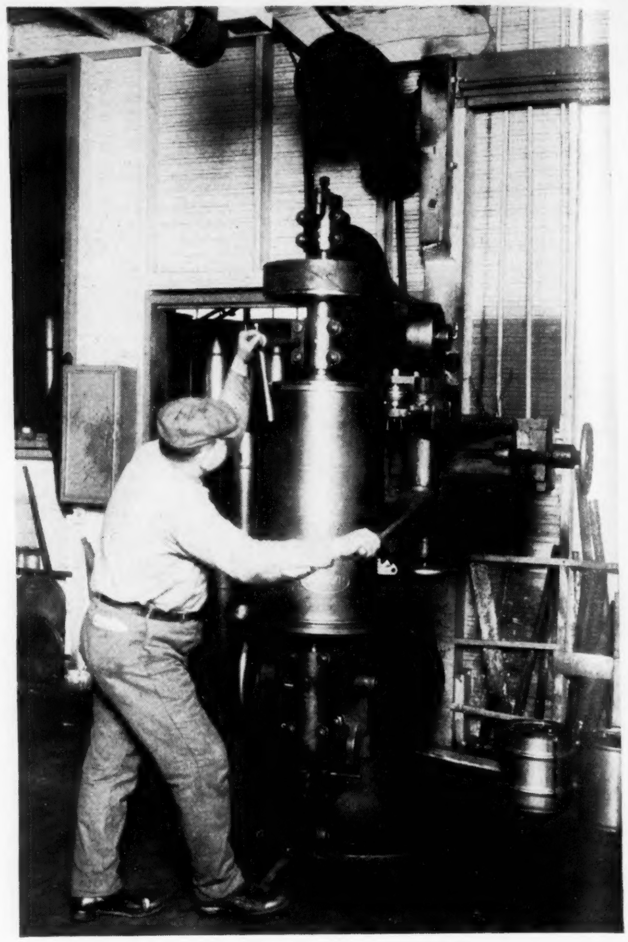
Above, the Swenson Forced Circulation Evaporator—a comparatively recent development, now widely in use.

Below, Swenson rotating-leaf pressure filter, designed for clarifying 50% electrolytic caustic liquor.



Swenson salt type rotary vacuum filter showing scraper for discharging the cake and re-pulper.

Tin to Sheet Metal to Steel Containers



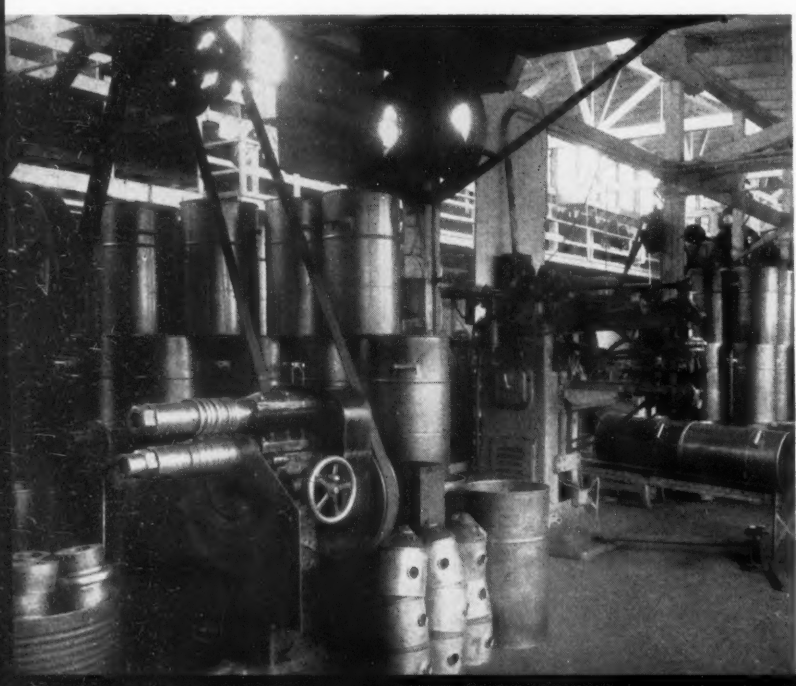
Development of The F. C. Thornton Co.

NEARLY a half century ago in what was then the outlying district of Cleveland, Frank C. Thornton visualized the growth of the city and started a small hardware business. Step by step this business grew and expanded into a tin shop, a sheet metal shop devoted to the building trades, a sheet metal manufacturing plant, and finally to a moderate sized, but extremely well founded drum manufacturing plant.

This uninterrupted expansion was accompanied by corresponding increases in floor space, the need for which has required new building work at the end of every five year period. In 1928, the importance of better facilities for serving the East was recognized, and this was accomplished by the organization of the Eastern Steel Barrel Corporation at Bound Brook, N. J. Present plans call for further expansion at both Cleveland and Bound Brook.

Thornton Experience Behind Operations

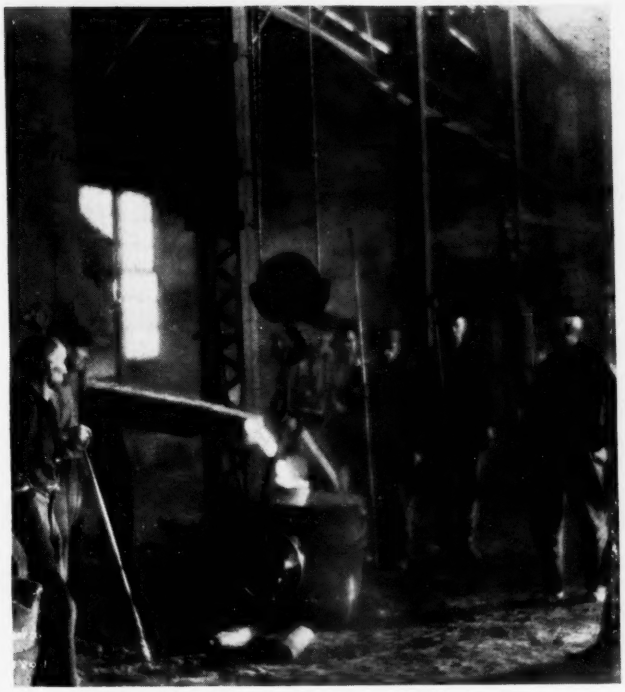
The general knowledge of sheet metal work acquired during the many years this company was engaged in this line has proven of inestimable value in the drum manufacturing business, providing a background for the development of new ideas and the perfection of methods of manufacture which have kept the products of The F. C. Thornton Co. in the forefront of the drum manufacturing industry.



During the last fifteen years the affairs of the company have been administered by Frank C. Thornton and J. J. Kojan, whose wealth of experience in the manufacture of sheet metal specialties in general and their ability to apply this knowledge to the manufacture of steel packages has accounted to a great extent to its success.

In order to continue the service in metal fabrication after The F. C. Thornton Co. decided to confine their activities to the manufacture of steel containers, two plants were established in Cleveland to handle all other types of sheet metal work. These plants are in charge of former employees of The F. C. Thornton Co., well fitted to carry on this class of work. They have been outstanding in their service to the chemical industry and have developed a national reputation because of their ability to fabricate metals such as aluminum, stainless steel, and the different alloys for which the chemical industry has found such great need in the last decade.

The drum manufacturing business of The F. C. Thornton Co. has been developed especially around the chemical industry. The endless variety of chemicals now being shipped in steel containers has necessitated literally hundreds of styles, sizes, and gauges of drums. Due to the flexibility which has always been maintained in our plant the company is in a position to supply an unlimited variety of containers on very short notice. Their services are always available for the development of new packages.



Interior of today's modern foundry, showing molten metal being drawn from a furnace preparatory to casting filter press frames.

68 YEARS

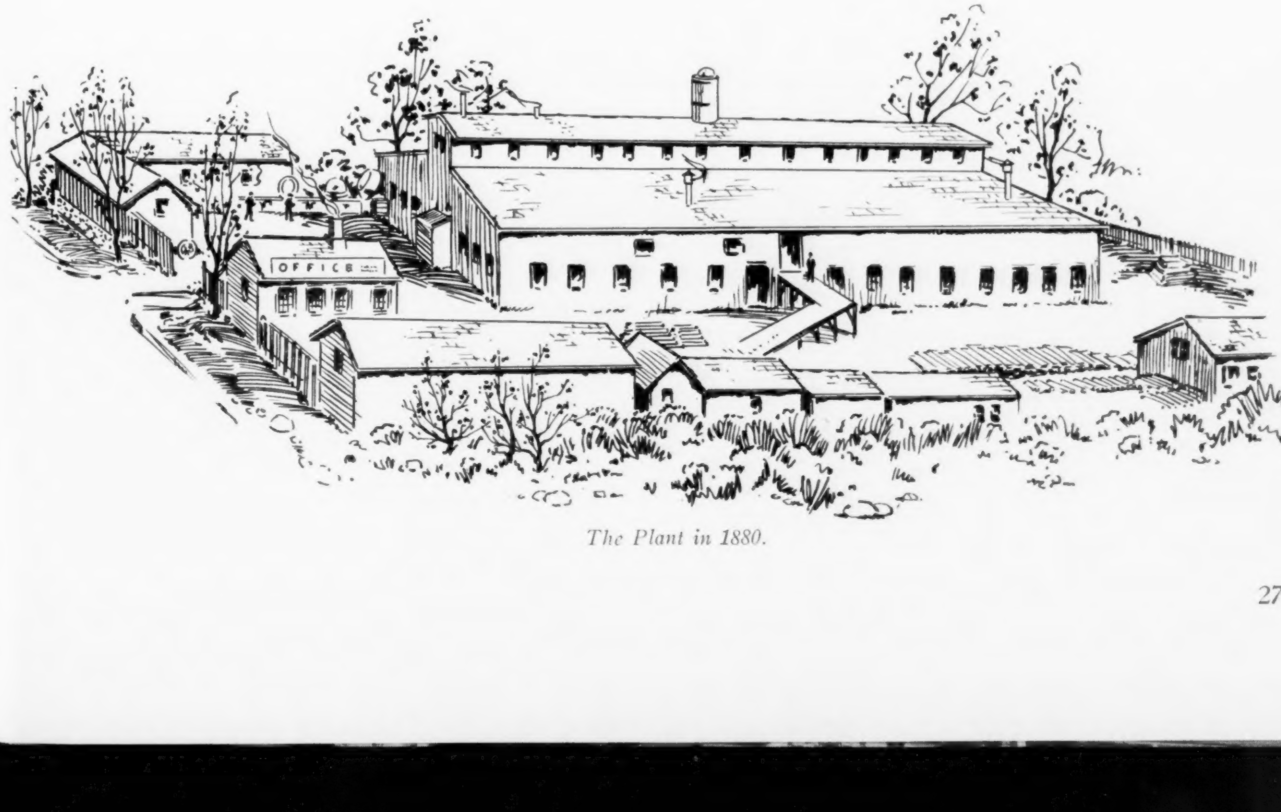
OF STEADY PROGRESS

The Dramatic growth of . . . . .

D. R. SPERRY & CO.

SHORTLY after the Civil War, in 1868 to be exact, there sprang up in the tiny village of Batavia, Illinois, the iron foundry of D. R. Sperry. The founding of a new business at a time when the country was going through one of the most trying periods in its history took rare courage. The first few years of the struggling young concern were dark indeed. Four years of strife had taken their toll. Orders were hard to get, money was none too plentiful. However, under able management the business prospered and grew, and in 1876 was incorporated. Gradually the operations of the Sperry Company spread. A reputation for quality of workmanship and prompt filling of orders was being built up. Growing pains continued. By 1881, under the pressure of further increases in business, the capacity of the original plant was overtaxed and the plant was moved to North Aurora, only a short distance from its present location. Mr. Sperry, who had always been known for his vision and foresight, selected a site on the banks of the Fox River, a short distance below the dam where water-power was plentiful and inexpensive.

On March 17, 1885, a fire of unknown origin completely destroyed the plant. Undaunted by this temporary setback, rebuilding was started at once, and soon operations were resumed on a larger scale than before. The opportunities for growth and better work provided by the new plant were not to remain undisturbed for



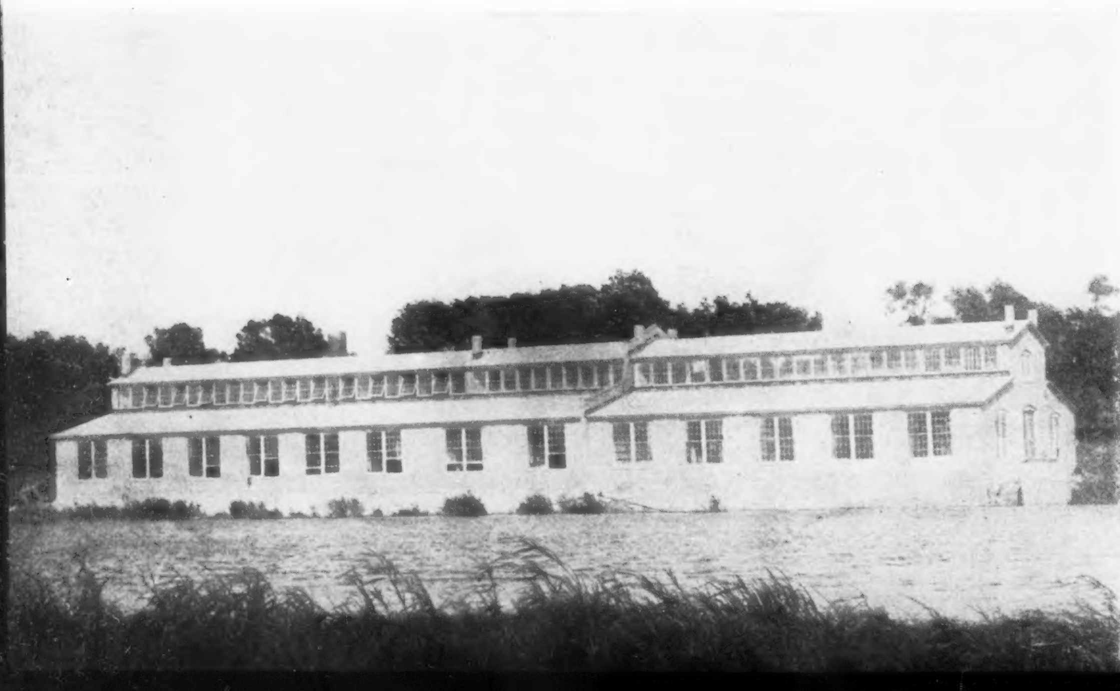
The Plant in 1880.

A photograph of the D. R. Sperry plant force taken when moustache cups and waltzes were all the rage. Each man carries the tool indicative of his craft.

long, however. Less than two years had passed when disaster struck again, this time in a different form. On February 8, 1887, the Fox River, a normally peaceful stream, went on one of the worst rampages in its history. The dam was carried away and both bridges at North Aurora were washed out. Water stood two feet deep in the office of the Sperry Company and it was several days before the flood waters receded sufficiently to permit work to proceed. Many valuable records and data were destroyed. The loss suffered was incalculable and weeks passed before normal conditions once more prevailed.

Shortly after came the turning point in the fortunes of the company. Up to this point the bulk of the Sperry business had been confined to manufacturing hollow ware. About 1890 the Wm. F. Jobbins Company of Aurora, after a series of conferences with B. E. Sperry, placed an order for a filter press. It marked the first contact with the chemical industry. The possibilities for expansion in this direction were at once apparent. A series of exhaustive tests and experiments were conducted under the personal direction of Mr. B. E. Sperry, son of the founder, who had become active in the business and intensely enthusiastic about possibilities for expansion in the chemical industries along the line of filtration. The aforementioned experiments convinced Mr. Sperry that his business was destined to become very closely associated with the chemical industry. He continued his research work in this field almost to the exclusion of everything else. In 1896 his father, Mr. D. R. Sperry died. Mr. B. E. Sperry immediately assumed charge of the business.

On April 5, 1903, the company suffered its third major disaster when fire again razed the plant. Instead of being downhearted, B. E. Sperry, who had inherited his father's indomitable courage, looked upon this stroke of misfortune as a blessing in disguise. It gave him the opportunity he had long been seeking to build a better, larger and more modern foundry. The buildings were to be located above the dam at North Aurora to eliminate the further danger of floods. Almost before the ashes of the old buildings were cold, workmen were hard at work on the foundations of the new ones. Working against time, three shifts of carpenters,



First plant built on present site—1903. At the time of its erection it was the last word in efficiency.

masons, and other workers were employed to rush the new foundry to completion.

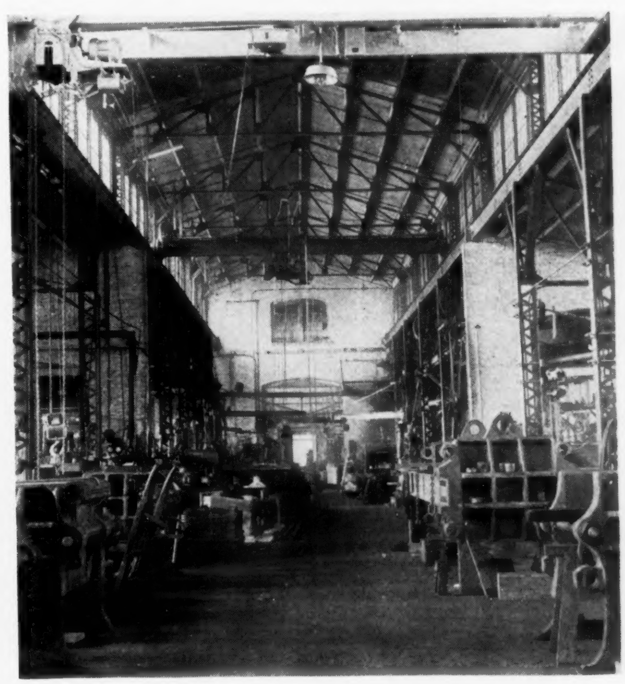
At the turn of the century, industrial chemistry was still in its infancy, but rapid strides were being made. America was awakening to the possibilities of great natural resources. In every branch of manufacturing, scientists and chemists were devoting twenty-four hours a day to research and experimental work. Discoveries were being made almost daily. Manufacturing processes were changing over-night. Industrial filtration was assuming a hitherto undreamed of importance.

The number of competent engineers able to give intelligent answers to questions on filtration were few. The long years of research and study now stood the Sperry Company in good stead. Sperry laboratories and data files were placed at industries' disposal. So closely did Sperry engineers work with scientists in other fields having these factors to cope with, and so remarkable were the results achieved, that the company soon became recognized as the authority on filtration. From this point on, expansion was more rapid than ever, almost mushroom-like. America was building up an enormous chemical industry, and the Sperry Company was keeping a steady pace. When the world suddenly found itself confronted by the Great War, the need for chemicals of all kinds became acute. Several weaknesses in the American chemical structure showed themselves. The demand for certain chemicals which Europe could no longer supply had to be met. Activities were redoubled. Increased production for war purposes was essential.

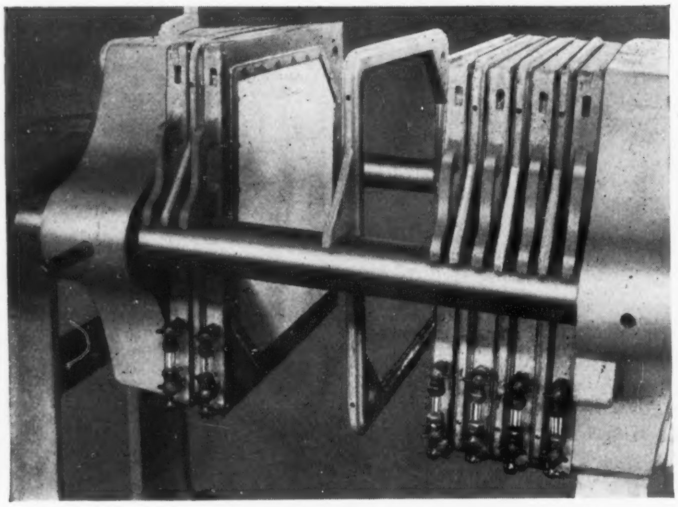
Mr. Sperry and his associates immediately planned for increased operating facilities. Every effort was bent to meet the demands they knew would be made of them. New buildings were added, extra shifts of workers were put on, feverish activity reigned. Mr. Sperry unfortunately did not see the fulfillment of his

This unusual exhibit attracted a great deal of attention at the World's Columbian Exposition, Chicago, 1893.

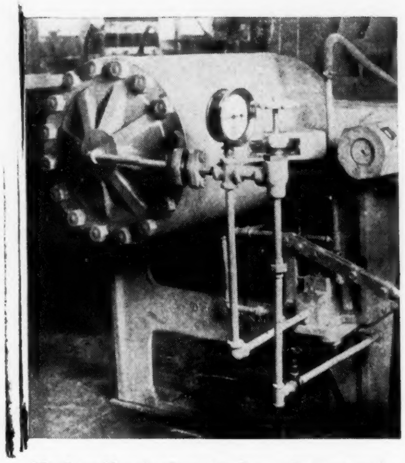
Private switching facilities mean fast delivery and easy handling of raw materials.



Interior of the great Sperry plant today.

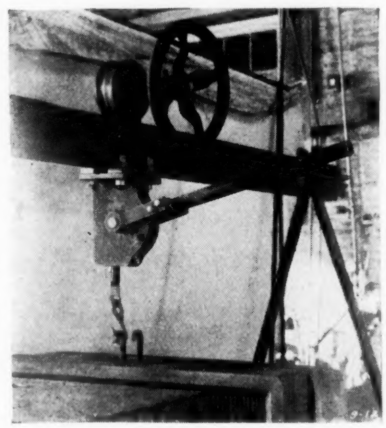


Type R. C. Filter Press of non-leaking construction. Used for handling volatile substances or wherever leakage at joints must be avoided. Can be used under back pressure. Has visible closed discharge.

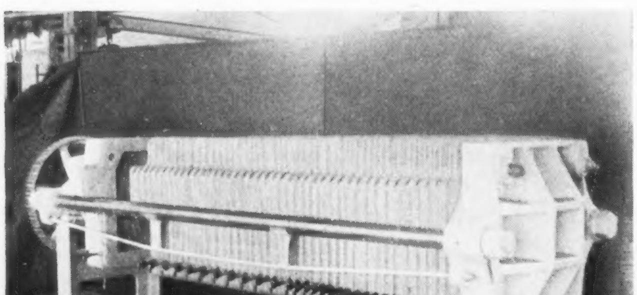


Hydraulic closing device. Operates by valves. Moves head forward and back. Pressure can be standardized. Prolongs life of filter cloths.

plans. He died January 5, 1916. Mr. E. C. Brown, who had been associated with the company since 1891 succeeded to the presidency. Mr. Brown having been thoroughly schooled in D. R. Sperry & Company ideals and plans for the future, continued the program of expansion. By 1917 extensive additions had been made, the most important of the new buildings being a large, and completely equipped machine shop. An all steel structure of the latest type, it was 220 feet long and 70 feet wide. The completion of this building was a very important step. It meant the complete independence of the Sperry Company of outside sources for the casting, machining, and tooling of even the most complicated parts. Each press was now manufactured as a complete unit in Sperry shops.



With this Sperry Plate Shifting Device one man can shift plates weighing as much as 500 pounds.

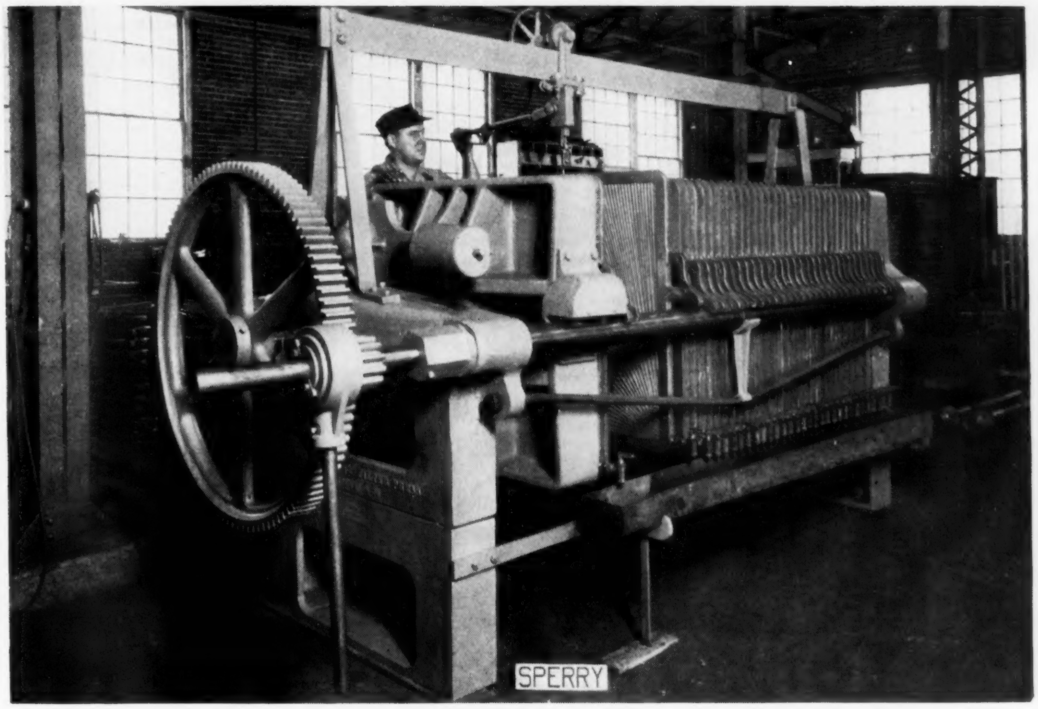


A new-type Sperry rubber plate filter press. It provides an economical, efficient method for filtering powerful acid liquors, hot or cold.

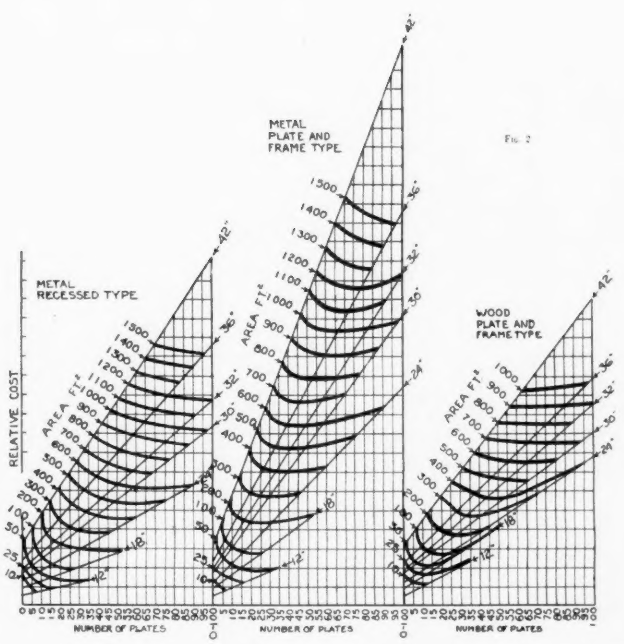
The post war depression slowed operations only a little. While many manufacturers were retrenching and cutting down on production, Sperry went ahead. The year 1920 showed that a progressive building policy was a definite necessity. The foundry had once again outgrown its capacity for turning out filter presses in sufficient quantity to keep abreast of the steady stream of orders. It was a far cry from the tiny shop of the late '60's, struggling to remain alive, to the modern young giant, outgrowing manufacturing facilities almost as fast as they could be provided.

More additions were built. Early in 1924 the erecting shop was completed. This plant, provided with the latest in modern machinery, enabled the Sperry Company to fabricate, assemble, and accurately finish filter presses of the largest size and the most complex type. It has been kept strictly up to date at all times.

A thoroughly modern chemical laboratory was pro-



A ratchet gear closing type press. Equipped with 42-inch Sperry Ni-Resist plates. Specially developed for the filtration of soap lye.

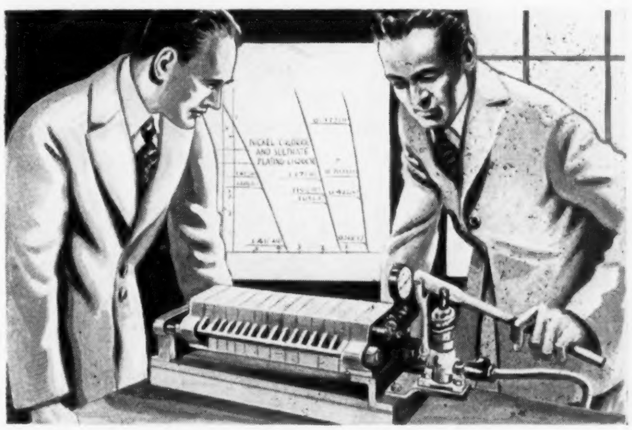


This chart is used to determine the most economical size plate to use after the total area has been decided upon.

vided for the company's engineering staff. It furnished every facility known to modern science for testing the many different materials submitted for analysis and determination of their filtration ability. Thus Sperry can quickly and accurately determine the most economical type of equipment for filtration of every conceivable material applicable to practically every manufacturing process.

Today D. R. Sperry & Company is recognized as the outstanding manufacturer of filter presses in the country. Every industry whose product presents a filtration problem is numbered among Sperry customers. Shipments of filter presses are made to every country in the world.

The present D. R. Sperry, grandson of the founder, is himself a chemical engineer of wide repute. His son, D. R. Sperry, Jr., is also active in the organization; thus representing the fourth generation in the business. Mr. Sperry, Sr., has devoted his entire life to the study, research and analysis of filtration problems, their solution, and the manufacturing of filter presses. Mr. Sperry is a recognized authority on this subject and has written several well-known articles on filtration.



Type C. S. 12" Laboratory Filter Press fitted with bronze plates, frames, piping, pressure regulator and pump. Has 4 sets of frames of various thicknesses.

Recovery of Solvent Vapors by

The Acticarbone Process

THE late John Teeple, noted consultant, is credited with having once remarked "that progress is largely the result of injunction." Certain it is that the solution of the problem of solvent recovery has been hastened for safety and health reasons, as well as for the economics involved.

Without detracting for a moment from the importance or appreciation of the first two considerations, the high cost of even the common petroleum solvents in Europe was an especially strong incentive for the development of a satisfactory process for solvent recovery on the Continent. The Acticarbone Process was developed in France fifteen years ago as the result of the urgent need of a large organization engaged in the recovery of gasoline from natural gas, for a means of extracting this gasoline safely and economically with activated carbon.

During the past decade it has developed rapidly. Today over 400 installations are operating in practically every part of the world recovering all types of industrial solvents amenable to adsorption recovery.

Space does not permit a detailed explanation of the Acticarbone Process although simplicity, safety and ease of operation of the equipment are particularly attractive features, in addition to the economies effected. The initial cost of the installation is decidedly lower than that for the older mechanical and liquid absorption systems. The operating costs are substantially lower and the efficiency extremely high. In fact, experience in hundreds of successful installations proves conclusively that the average cost of recovery is between one-half and one cent per pound of solvent recovered. The solvent is of the highest quality as recovered and does not have to undergo any purification before re-use, but perhaps the most attractive feature of the process is its ability to successfully operate with solvent vapor concentrations away beyond the effective range for the older processes.

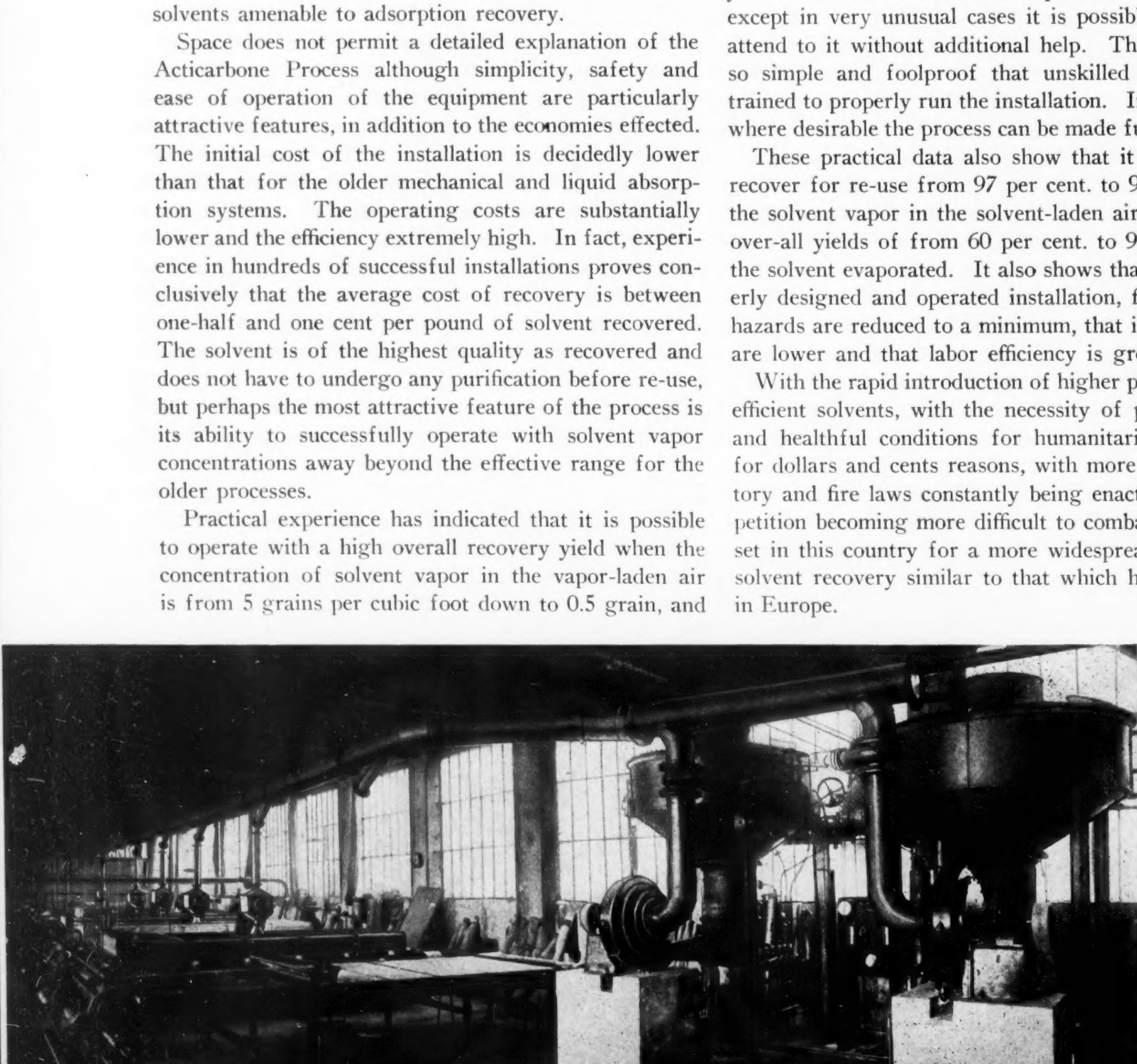
Practical experience has indicated that it is possible to operate with a high overall recovery yield when the concentration of solvent vapor in the vapor-laden air is from 5 grains per cubic foot down to 0.5 grain, and in extreme cases even as low as 0.09 grain. This makes it possible to aspirate large volumes of air, thereby increasing the captation or vapor collecting efficiency of the installation and permitting the operation of the recovery plant itself with a solvent vapor concentration in the solvent-laden air far below the lowest explosion limit. The factor of safety introduced thereby has resulted in many cases in a reduction of from 10 to 15 per cent. in insurance premiums.

The recovery installation consists of suitable filtering apparatus having a specially designed compartment to arrest the propagation of any accidental spark or flame originating in the workrooms; the adsorbers containing the activated carbon; a condenser to condense the solvent vapors removed from the adsorbent, and a decanter to separate the solvent from the condensed steam when the solvent is immiscible with water. If the solvent being recovered is partly or wholly miscible with water, an automatic continuous rectifying column is provided with the installation.

Examination of operating data accumulated over more than a decade definitely shows that the activated carbon recovery process, when properly designed and operated, can effect such large savings that it will be amortized within a period of from six months to two years. The amount of labor required is negligible and except in very unusual cases it is possible to properly attend to it without additional help. The operation is so simple and foolproof that unskilled labor can be trained to properly run the installation. In special cases where desirable the process can be made fully automatic.

These practical data also show that it is possible to recover for re-use from 97 per cent. to 99 per cent. of the solvent vapor in the solvent-laden air and to attain over-all yields of from 60 per cent. to 94 per cent. of the solvent evaporated. It also shows that with a properly designed and operated installation, fire and health hazards are reduced to a minimum, that insurance rates are lower and that labor efficiency is greater.

With the rapid introduction of higher priced but more efficient solvents, with the necessity of providing safe and healthful conditions for humanitarian as well as for dollars and cents reasons, with more stringent factory and fire laws constantly being enacted, with competition becoming more difficult to combat, the stage is set in this country for a more widespread adoption of solvent recovery similar to that which has taken place in Europe.



View of a complete Acticarbone recovery installation, visualizing the simplicity and compactness of the equipment.

A Perfect Union Between Art and Science

Chemical Stoneware Manufacture, While Still Largely Following the Practices of Pottery Making, Oldest of Crafts, Has Enlisted the Aid of the Chemist, Engineer, and Trained Ceramist

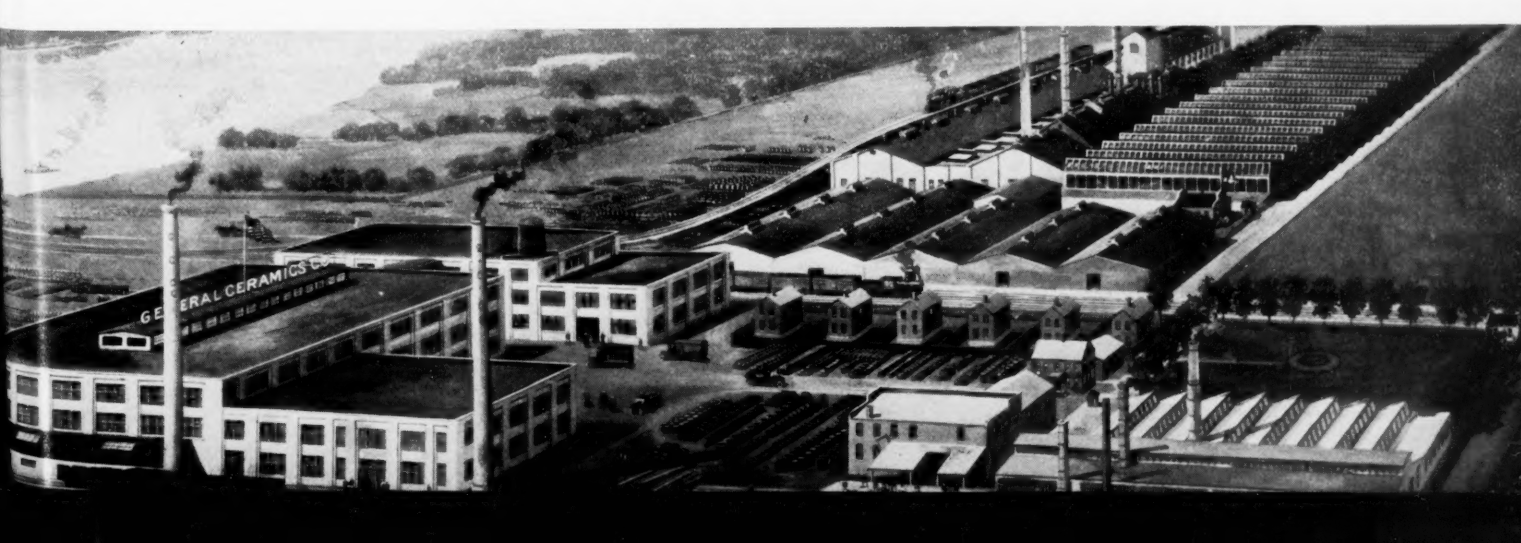
THE shaping of plastic clay and subsequent hardening by fire is the oldest art of which we have any record. The reason for this is that clay products alone withstand the action of fire, solution, abrasion and chemical corrosion which, over a period of centuries, destroy all other materials. The importance of ceramic products in modern chemical engineering is largely due to this same resistance to destructive influences. For many centuries ceramic ware was practically the only material available for the preparation of highly corrosive products. In fact, it is scarcely an exaggeration to say that in the early days of industrial chemistry, progress, in so far as it related to the production of corrosive materials, was largely dependent on the ability of the ceramist to make the equipment demanded by the chemist.

The beginnings of modern ceramic ware specifically for the chemical industry were laid in England early in the nineteenth century by Doulton & Co. of Lambeth, England, being at that time the world's largest producer of industrial chemicals. About one hundred years ago Ernst March of Charlottenburg founded the industry in Germany from which by natural development and consolidation evolved the Deutsche Ton- und Steinzeugwerke, A. G. By 1907, the importations from this important organization into the United States had grown to such proportions as to justify the operation of a plant at Keasbey, New Jersey, under the name of the Didier-March Co. Up to this time it had been necessary to import all large or complicated chemical stoneware shapes and stoneware machinery such as centrifugal and plunger pumps and exhaust fans, domestic manufacturers being equipped to make only the simpler shapes. In 1912, owing to the growth of the chemical stoneware business, it was found necessary to divorce other manufacturing activities of the company, and the German-American Stoneware Works was formed. In 1919, the German holdings were taken over and ultimately sold by the Alien Property Custodian and the name was changed to the General Ceramics Company. The Company, therefore, had at its disposition the accumulated experience of practically the entire European industry and periodical visits by its technical men enable it to bring to American chemical manufacturers any new technique or new equipment that may be developed abroad.

During the World War the plants of the General Ceramics Co. performed yeoman service for this country and its allies in turning out chemical stoneware equipment for the manufacture of explosives, poison gas and other essential chemical war materials. Like many other plants, the signing of the Armistice found the company with greatly expanded facilities. Undaunted, however, its officers proceeded to introduce larger equipment and more varied lines of chemical stoneware for the expanding chemical and process industries. They cooperated actively with the engineers of such companies in the design and installation of types of stoneware equipment heretofore thought impossible to erect and provided apparatus for severe service where ceramic ware was indispensable.

During the past thirty years the metallurgist and the synthetic chemist have entered the corrosion resisting field, the metallurgist with metals and alloys which a few years before were not much more than curiosities outside the laboratory, and the synthetic chemist with a

Of particular interest to the chemical and process industries is the Keasbey, N. J., plant of the General Ceramics Company, one of several operated by the company, for in this plant is centralized the manufacturing of most of the chemical stoneware produced for those fields.



great variety of products. None of these materials has the universal resistance to corrosion of ceramic ware. They are resistant to some chemical products but energetically attacked by others, they do not have the flexibility in design that is possible in shapes made of plastic clay and they are almost invariably much more expensive. This invasion of a field in which the ceramist has had a virtual monopoly since chemistry became an industry has been very much to his advantage. It has been an incentive to improve his materials and equipment and to find new uses for his products not only in the chemical industry but in related fields such as textiles, food products, metallurgy and photography. The increased demand for industrial ceramic ware, due to these activities, has shown a steady and consistent growth requiring a substantial addition to the manufacturing facilities of the General Ceramics Company during the past few months.

These favorable results are also due in part to a change in the mental attitude of the chemical industry to the use of chemical ware. Before the General Ceramics Company entered this field only simple shapes of comparatively small dimensions were made in this country. Now that high grade products are produced here, this prejudice has disappeared and chemists and engineers are continually calling upon the Company to solve difficult problems requiring the design and manufacture of large and intricate stoneware equipment.

The production of chemical stoneware has not been in a static state in the plants of the General Ceramics Company. Constant research has produced a number of notable contributions to the advancement of American chemical manufacturing progress, a few of which are as follows:

1. A stoneware body as dense as high grade porcelain which can be fabricated into shapes and sizes suitable for plant scale operation.
2. A porous ware having fifty per cent. or more voids which still retains a high mechanical strength.
3. A white stoneware with a brilliant white glaze.
4. A stoneware body with a coefficient of expansion far below that of any other silicate product with a consequent high resistance to thermal shock.
5. A stoneware body having a coefficient of thermal conductivity four to five times that of the usual stoneware product.

Molding large pieces of chemical stoneware equipment at the Keasbey plant of the General Ceramics Company. Large or small every article receives the personal attention of a skilled artisan.

Other remarkable achievements brought about by cooperation between the ceramic and engineering departments of General Ceramics Company in the past ten years include a five-fold increase in the tensile strength of chemical stoneware, making possible the design of pressure vessels and high-speed machinery, such as centrifugal pumps and exhaust fans; a fifty per cent. increase in the ultimate compressive strength to the remarkable figure for a clay product of sixty tons to the square inch; a hundred per cent. increase in the resistance to impact, and a decrease of over forty per cent. in the loss by abrasion. The use of the "de-airing" process, in which all occluded air is removed by subjecting the finely shredded clay to a high vacuum, has helped in achieving some of these desirable characteristics.

A visitor to the Keasbey plant of the General Ceramics Company, watching the production of both simple and intricate pieces of chemical stoneware equipment, is instantly struck with the thought that here is a perfect union between art and science. Ceramics, the world's oldest handicraft, which has for a hundred centuries contributed so much beauty and comfort to the life of mankind, is transformed in this plant by scientific research and modern manufacturing methods into an important agent in the material progress of the present industrial age. True, mass production is here, but in no way in the sense that the term is employed in describing, for instance, the operations in an automobile factory. The most lowly workman is indeed a craftsman, an artist; each piece receives the personal attention of a master potter. The chemist, the physicist, and the engineer have combined to provide him with tools and methods for producing the exacting apparatus required for modern chemical operations, but the production of chemical stoneware is still essentially a craft and requires artisans who have literally "been born" to the trade.

A detailed description of the manufacture of chemical stoneware is beyond the scope of this article, yet a few explanatory words are essential, for even many large users of such equipment have but the haziest of ideas on the subject. The plastic raw materials used are ball clay and kaolin. The non-plastic raw materials used are feldspar, silica, in various forms, and pulverized stoneware or porcelain. In addition, for the development of certain characteristics, a wide variety of other ingredients are often added as, for example, steatite. As the composition of many of these raw materials varies constantly the problem of control of the body compositions is a difficult one requiring the utmost care and experience.

The raw ingredients are prepared for use by pulverizing, washing and filter-pressing. Most of the methods used for forming clay products today are in principle the same as those of a thousand years ago but the present gigantic steam, hydraulic and screw presses,

the electrically operated turntables, the large and complicated plaster molds bear no resemblance to their simple forbears. In the case of chemical stoneware, the variety of shapes required for industrial purposes is so wide that all the various methods of forming clay products are utilized.

The forming of the clay body into the desired shape is followed by the drying of the ware. The water content varies from five to thirty per cent. and must be removed very slowly to prevent drying strain. For smaller pieces the General Ceramics Company has installed a huge humidity chamber dryer. For the larger pieces the operation is conducted without the use of a dryer, but under closely controlled conditions of temperature and humidity.

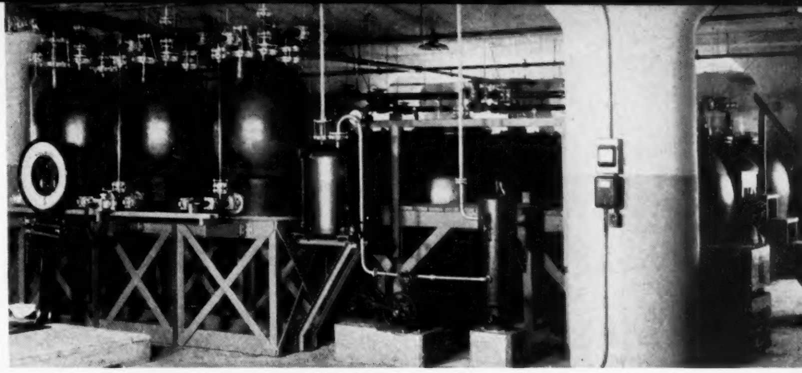
The vitrification of the stoneware used for industrial purposes is usually complete at 1250° C. This operation is carried on in large periodic kilns. As the maximum temperature is approached the ware receives a "salt glaze". Salt glaze is dense and hard, and resists all chemicals excepting only hydrofluoric acid and hot strong caustic alkalies that also attack glass. It differs from all other glazes in being thermochemically combined with the body so that it cannot peel off or develop the minute fissures known as "crazing" often found in other glazes.

When the salt glazing is completed the kiln atmosphere is again changed from reducing to oxidizing and the temperature is increased in order to give the glaze a smooth surface and a bright luster. The contents of the kiln are then very slowly cooled until the ware can be removed.

Very often special glazes are required. These are applied to the surface by brush or spray or dipping, and usually consist of prepared mixtures of silicates. Such glazes must bear a definite relationship to the body to which they are applied.

The physical properties of stoneware make it impossible to use the conventional equipment and methods employed in machining such materials as metal and wood. It is usually ground to dimensions, using grinding machines common to other industries for this purpose. Machines designed for the specific purpose of grinding and polishing stoneware are also used.

Today literally thousands of different types of equipment are made of chemical stoneware. They are employed in hundreds of different industries, including the chemical, electrical, textile, food, pulp and paper, metallurgical and other chemical process fields. A substantial part of the production of the industrial ceramic plants includes piping, valves, traps, gutters, sinks, pumps, exhaust fans, blow cases, tanks, jars, evaporating pans, stills and kettles, sublimers, storage equipment, towers, coils and condensers, tourills, filters, ball mills, etching machines, ejectors, vacuum apparatus as well as a large amount of small miscellaneous ware such as dipping baskets, carboy stoppers, pots, jugs and funnels. With a close check constantly maintained on both raw materials and finished products the user



Only the very simple designs of chemical stoneware were produced in this country until the General Ceramics Company started operations. Now the most difficult, intricate pieces of equipment are made at the Keasbey plant.

of chemical stoneware made by the General Ceramics Company can always be assured that identical replacements can be had by simply identifying the number stamped on every piece of equipment.

One great advantage of stoneware for industrial chemical purposes is that laboratory apparatus is not only translated directly into plant equipment, but the glass and porcelain of the laboratory is replaced in the plant by another ceramic product similar in composition and physical characteristics.

In the past twenty years one of the most important uses for chemical stoneware has been in the equipment of laboratories. Hundred of schools, colleges and commercial laboratories have turned to ceramic ware and, in the last few years, the development by General Ceramics Company of a white ware covered with a brilliant white glaze has accentuated this trend tremendously because of the attractive appearance and the ease with which such equipment can be kept scrupulously clean.

The chemical literature is full of accounts of attempts to solve corrosion problems by the use of structural materials that are resistant only under certain limited conditions. The definite statement of General Ceramics Company engineers to the chemical and chemical process industries is that when "chemical stoneware" is specified there are no corrosion problems.

So much for the past and present. What of the future? Now that the ceramist and engineer have formed a triumvirate with the craftsman the manufacture of stoneware equipment is under the wing of science. Future advancement is certain to come from patient work in the plant and laboratory directed toward a specific end. The General Ceramics Company is in the forefront of this movement, and maintains a well-equipped laboratory manned by trained chemists and ceramic technicians. Some of their objectives are to increase still further the density, mechanical, and dielectric strength, thermal conductivity, resistance to mechanical, electrical and thermal shock and to the action of alkalies. It has been a glorious past but the future holds even brighter possibilities. Chemical stoneware has faithfully served the chemist and engineer in solving many problems of manufacture; in the future it will be of still greater service as these problems increase.

EDWARD F. PINK

President of the Cambridge Wire Cloth Company, Inc., since 1915.

Pioneer in Wire Cloth and Wire Belting

Cambridge Wire Cloth Company Successfully Meets the Challenge of Industry for Suitable Materials and Methods for Overcoming Corrosion Problems in the Chemical and Process Fields

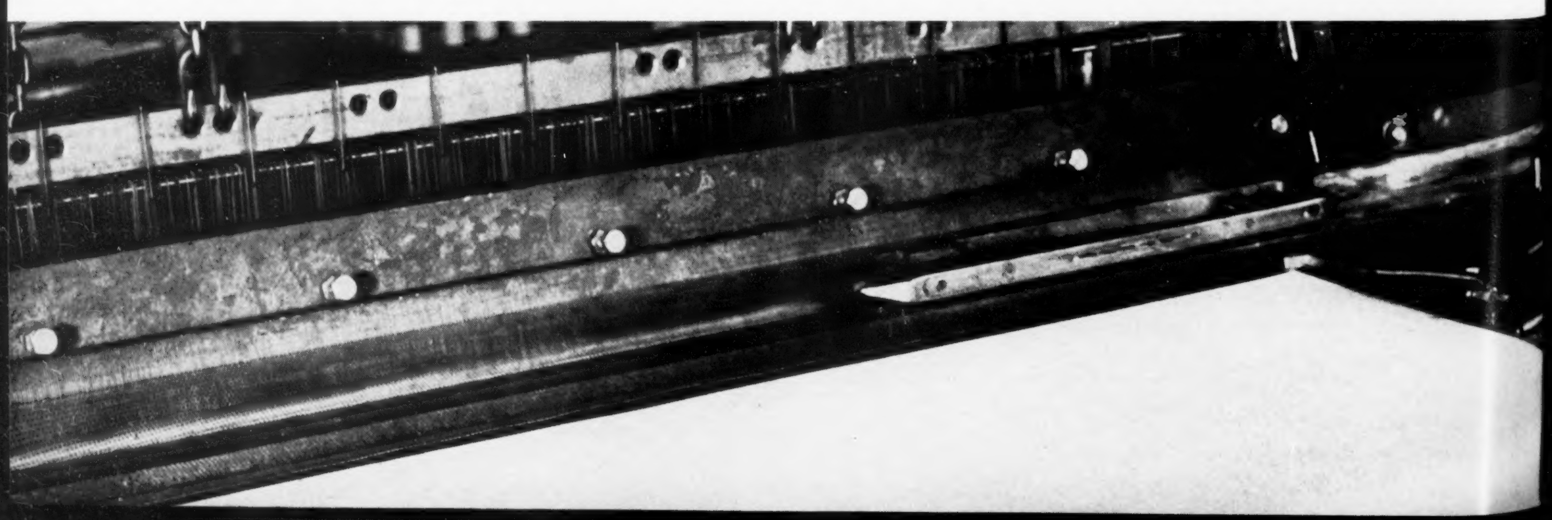
THE year following the outbreak of hostilities in Europe and two years before we were drawn into the holocaust, Edward F. Pink, plant superintendent of the then well-known Estey Wire Works of New York City and a technician with thirty years of intimate contact and knowledge of the wire cloth industry, founded the Cambridge Wire Cloth Company. He had a very definite purpose in mind. Because of his years of practical experience in manufacturing and his expert knowledge of the requirements of industry, he limited the scope of manufacture to those weaves and meshes that had definite industrial uses. He was peculiarly fitted to serve efficiently those fields where difficulties were then being encountered involving the mechanical separation of products. Now, after twenty years of outstanding contributions to the advancement of the chemical and process industries, his untried policy of restricted manufacture in the wire cloth industry has proven highly successful. In these twenty years he has served as president and manufacturing head.

The establishment of the company in the early years of the War, while purely coincidental, nevertheless spelled immediate success for the Cambridge company. The challenge of industry was met successfully. The overnight development and breath-taking growth of "Chemical America" provided a virgin field for specialization. Dire necessity called for the best that the American mind could invent and supply in the fields of handling and processing raw materials. It meant new and in many cases revolutionary ideas for screening, sifting, straining, bolting, refining and filtering. Perfection of mechanical devices which would release manpower were vital, and the Cambridge organization played a vital part in the mechanization of industry, both during the war period and in the last two decades.

The construction of equipment has never been within the province of the Cambridge Wire Cloth Company, but from its inception it has accumulated, from the close association with equipment engineers, an expert knowledge of mesh, weaves and metals and their individual failures or accomplishments under actual operating conditions. In the face of an almost religious desire to provide for its customers accuracy and precision, Cambridge in the early days found itself under a handicap which could not immediately be corrected. None knew better than Mr. Pink and his associates that the equipment common to the wire cloth industry was not on a par with advanced European machine practice and design. The Cambridge Wire Cloth Company was the pioneer in bringing to America wire weaving looms from England, Scotland and Germany, on which are now woven square double crimped meshes, twilled weaves, and Dutch filter cloth of steel, galvanized, copper, brass and bronze wires, and the more special metals such as Monel Metal, nickel, and chrome-nickel alloys. The Cambridge filter weaves of Monel Metal, chrome-nickel alloys and copper alloys are specially popular in the chemical and allied fields for use in all types of filters, and Cambridge double crimped weaves are also extensively used for backing screens, etc.

Cambridge Wire Cloth Company engineers have developed a highly specialized technique in the design and manufacture of wire cloth over a period of twenty years.

Combating corrosion in industry is an important field



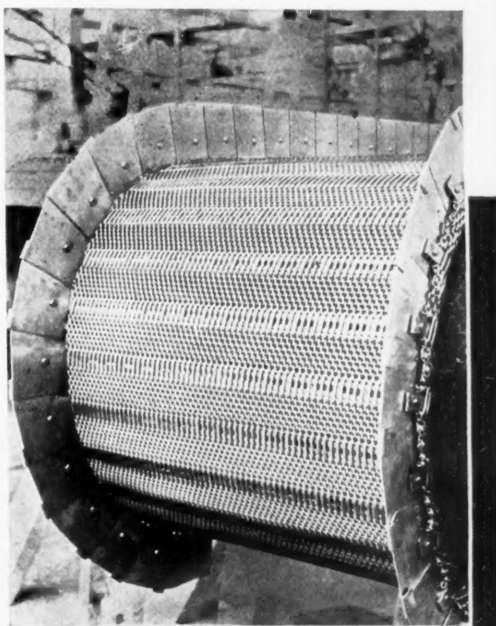
of present day endeavor, because greater purity of end products is demanded and because industry today must employ materials of highly corrosive nature. Permanency is yet but an ideal, but Cambridge engineers have been leaders in adopting the newer metals and alloys for manufacture of cloths for specific purposes. This wealth of knowledge and experience is available to chemists, engineers, consultants and plant managers. A few general statements will prove helpful, however. Wire cloth, screens and belts woven of Stainless Iron No. 12 (straight chrome alloys) wire are of importance where high physical properties are needed, combined with good resistance to atmospheric conditions for such items as fruit, vegetable acids and weak chemicals. When resistance to the corrosive action of chemicals, acids and alkalies is important, 18-8 chrome-nickel steel is usually employed; where high temperature usages are encountered, plus highly corrosive media, 25-20 chrome-nickel steel (chrome-nickel-silicon) is generally most suitable.

But half the story of Cambridge would be told were reference not made to the company's contribution to industrial progress through the introduction and development of the well-known Cambridge Spiral Woven Wire Conveyer Belting. Again the European conflict called attention to American manufacturers' unreadiness. When those engaged in the sugar industry in Cuba, South America and the Philippine Islands were unable to obtain from Germany and France the spiral woven centrifugal linings they required, they turned to America, but in vain. No one had ever attempted its manufacture. Cambridge in a year perfected a machine on which to weave this very fine mesh spiral fabric. This experimentation resulted in an exclusive contract very profitable to the company until the reentry of France and Germany into the world markets.

The extreme flexibility of this spiral wire fabric did, however, attract considerable attention. Soon the fabric replaced wire cloth aprons in many industries, and later replaced belts of canvas, rubber and similar fabrics. Its cleanliness, and when made of Monel Metal, nickel or stainless steel, its resistance to corrosion, further, the elimination of product contamination, won for it a high place in the food industries for belting upon which to safely convey "fussy" products through washers, scalders, cookers, sprays, dryers, etc. Soon the larger, more open mesh and heavy duty Cambridge Spiral belt specifications were developed. In 1920, Cambridge engineers designed the first spiral belt for pigment drying wherein the belt passing over the filter drum, picked up in its open mesh the "slurry" and carried it uninterruptedly in this layer formation through the dryer. Today these belts average about 600 feet long and five feet wide, and are woven of bronze, Monel Metal, and 18-8 chrome-nickel alloy. In 1924, the Cambridge company began to experiment with high temperature operations. In a few years, the Cambridge Spiral Belt was generally adopted by the glass industry for carrying bottles through lehrs or annealing ovens. In present operations these belts, weighing 3,000 pounds and over, are constructed with stayrod reinforcements to withstand a carrying load through temperatures of 1,000° F. Recent patents, controlled by the company, cover belt constructions which, when woven of nickel chrome alloy wire, will operate successfully through temperatures as high as 2,080° F.

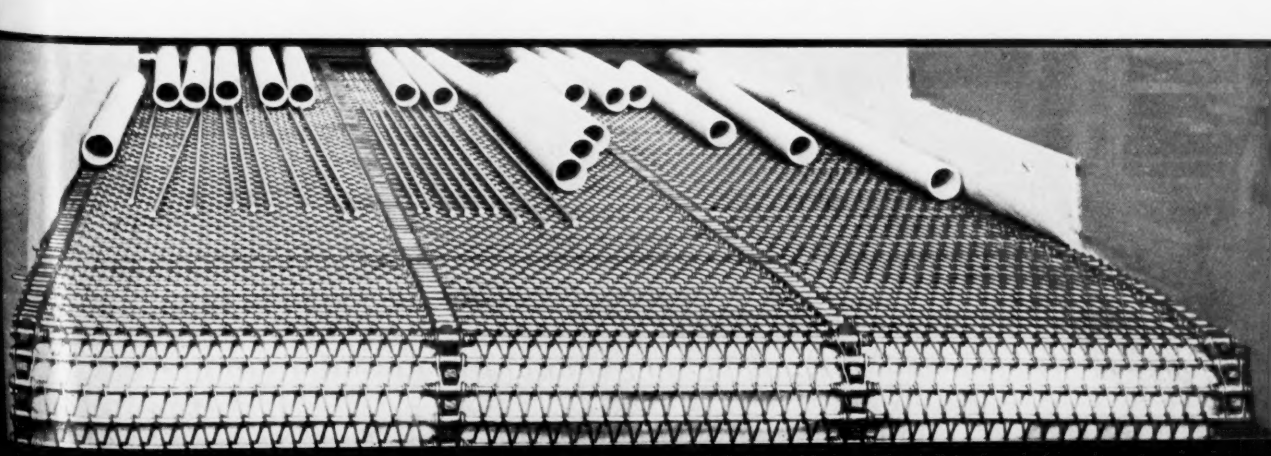
The advantages of belts of open construction are several. Special treatment of products simultaneous with their movement on the belt is an important one. It allows free and unobstructed circulation of water, steam, air and heat so that products while on the belt can be washed, cooked, steamed, cooled, dried, filtered, sprayed or annealed, while the belt itself can be kept clean. Such belts will carry all products irrespective of their weight or size with the exception of liquids and finely pulverized materials, but these can be carried if contained in receptacles. Finally there are no limitations as to the length or width of the belts.

Service is an important part of any equipment company's organization. Recognizing this very early the Cambridge Wire Cloth Company has improved manufacturing facilities and increased the sales and service division so that now practically the entire Eastern half of the country is covered by engineers who are capable of studying each individual problem whether it be a wire cloth requirement or a spiral wire belt application and to make satisfactory recommendations.



Frictional Drive Mesh Belt, with Retaining Edge by Cambridge Wire Cloth Co.

Chain and Sprocket Driven Mesh Belt by Cambridge Wire Cloth Co.



The Solution of Accurate Weighing Through Pure Research

ONE year ago John Chatillon & Sons, manufacturers of precision weighing instruments, completed 100 years. They viewed the future, not through the dimmed eyes of the centenarian, thinking only in retrospect, but rather with a buoyant, progressive spirit that respects the past for its achievements and experience, but also pays homage to the future, because of the promise of the accomplishments to come.

Engineers of the company several years ago designed and perfected a conveyor scale which indicates, registers and records. The register or recorder or both may be located at any distance from the machine or from each other, as they are electrically operated. Permanent and final calibration of the Telepoise Conveyor Scale is made at the factory and can be set up without the assistance of factory experts.

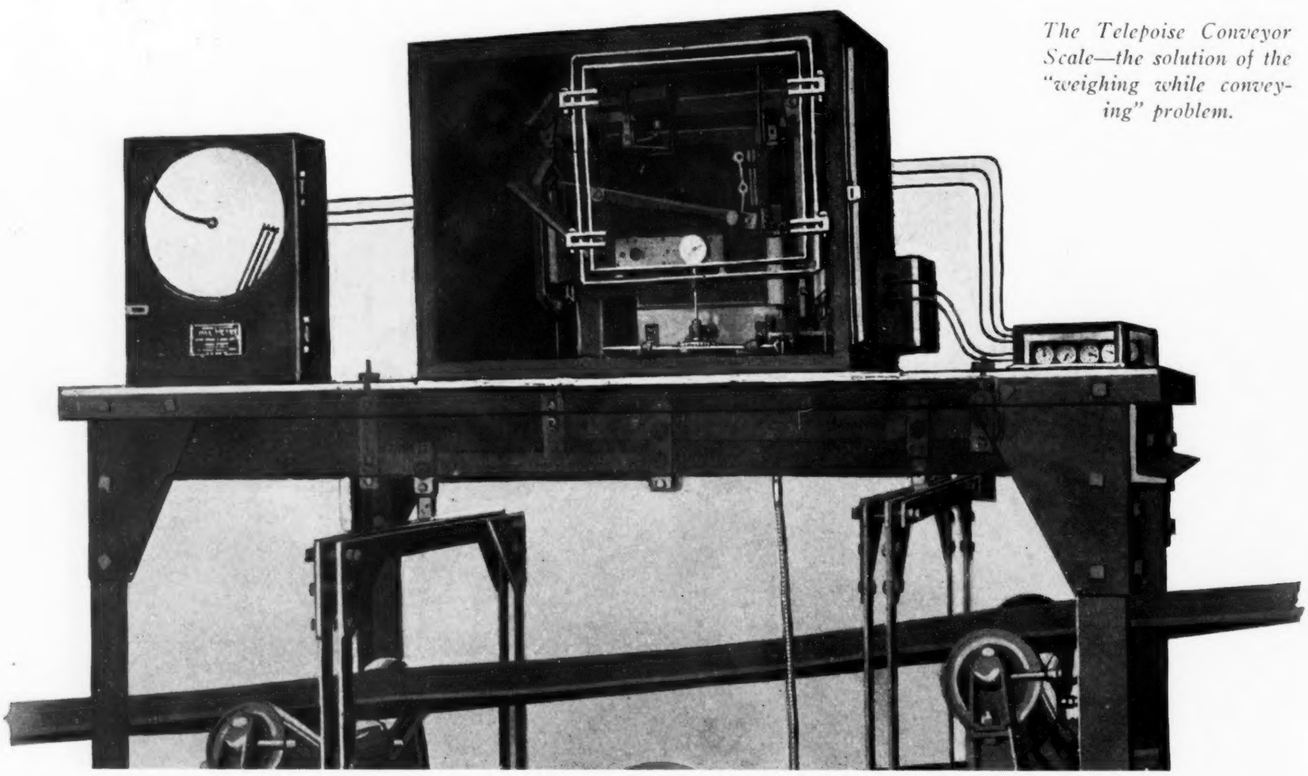
The weigh beam is absolutely free, its only function being that of weighing, with no dashpots or mercury floats attached to it to introduce errors or destroy calibration.

The Telepoise Conveyor Scale possesses twelve exclusive features. In addition to those already mentioned, such advantages as the elimination of grease or oil, the simplicity in balancing, the fact that the load indicator instantaneously informs the operator of the rate of feed, and the mathematically correct method of correlating the speed of the conveyor belt and integrating mechanism have a strong appeal to those struggling with "weighing while conveying" problems. In the chemical and process industries many operations may be greatly simplified and done more accurately with Telepoise equipment.

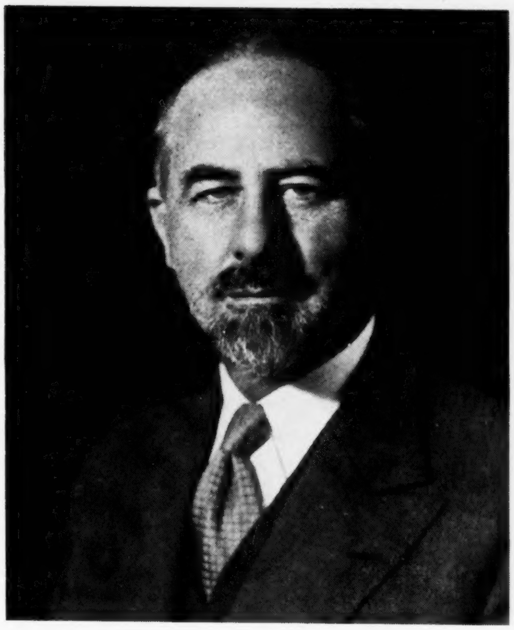
Engineers of the company are watchful of the achievements in science in order to adopt them, where possible, to the manufacture of still more accurate spring scales. Original research, too, has been conducted over a long period of years and has proven fruitful and of great practical value.

The engineers made what is believed to be the only comprehensive and successful attack on the fundamental problems involved. After years of intensive research, "Iso-Elastic Alloy" was developed; being the most outstanding contribution yet to be made in the field of accurate springs used in scales and force measuring devices. Such errors as were caused by temperature changes, creep, straight line error and hysteresis, common to other springs, are reduced to the vanishing point in Iso-Elastic springs, resulting in a degree of accuracy heretofore unattainable.

Accurate springs were the object of the engineers' intensive research. However, many and varied uses have been found for which this alloy is peculiarly adaptable; space not permitting a detailed description. John Chatillon & Sons have amassed a wealth of varied experience which they will gladly place at the disposal of companies interested.



The Telepoise Conveyor Scale—the solution of the "weighing while conveying" problem.



John Van Nostrand Dorr

Wherever Solids are Suspended in Liquids

The Story of the Dorr Company

How An Idea Grew to Be a Company

IT'S a long way back to the winter of 1904 and a small gold mill, precariously perched on the hillside overlooking Deadwood Gulch in the Black Hills of South Dakota. But it was in just such a picturesque setting as this, thirty-two years ago, that a basic idea was quietly born—an idea that, carried to its logical conclusion, became the keystone of the entire Dorr structure of today.

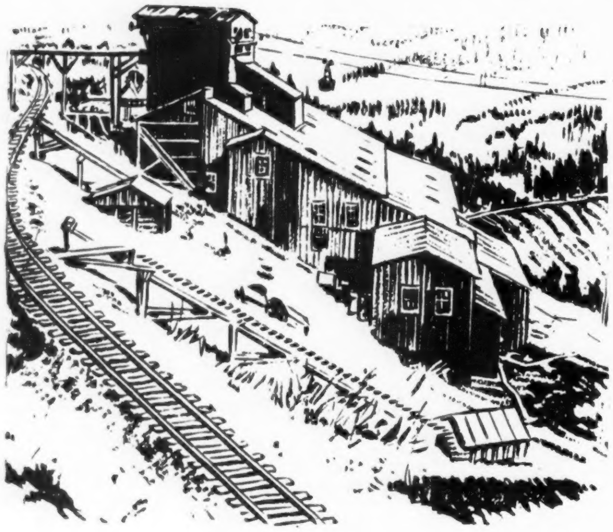
The forces and circumstances attending the birth of a company are often very much a matter of chance. So, too, are the influences that shape its destiny during its early years. Chance, in this instance, set the stage on which a problem of faulty classification, an unprofitable gold milling venture and a managing director of an inventive frame of mind met. And the urgent necessity of staving off creditors provided the stimulus that hastened the formulation of an entirely new method of handling and treating finely divided solids suspended in liquids—a method that soon outgrew the little Lundberg, Dorr and Wilson mill and spread to more than four-score processing industries on six continents.

Where thirty some years ago one man solved a problem in his own plant, there are now over two hundred of his engineering staff, still following his leadership, solving a wide variety of solid-liquid handling problems for others. Where, initially, the new techniques were applied in but one industry—gold and silver milling—today these techniques are common throughout all of base-metal metallurgy, most of the chemical and allied industries and even sewage, water and trade waste treatment. Where a single patent existed thirty years ago, there are today well over a thousand, protecting not only a long line of continuous processing apparatus but also processes themselves that have sprung from a continuous research and development program. The Dorr Company of today, with its associated companies abroad, is still very much the lengthening shadow of its founder and of his inventive genius.

The Dorr Company dates from 1916, when it succeeded the Dorr Cyanide Machinery Co., formed in 1908. The date 1916 and the change in the corporate name are significant in that they mark the swinging away from purely metallurgical work in the West and the beginning of extensive chemical work in the East and abroad. Today the company is international in its scope, for in addition to six offices in the United States and Canada, it has associated companies in England, France, Germany and The Netherlands that, in addition, supply a service in filtration through an association with the American concern, Oliver-United Filters, Inc. In South America, South Africa, Australia and Japan there is also Dorr representation. World wide influence in technical circles has brought with it world wide responsibilities. And a constant interchange of staff across two oceans has had a broadening influence, making for a sane and tolerant attitude in the face of recent complex international situations.

Doing One Thing Well

All down the years since its inception, the Dorr organization here and abroad has directed its energies to doing one thing well—superlatively well. Its work has been the highly specialized one of handling and treating solids suspended in liquids, wherever such solid-liquid mixtures undergo chemical or physical change. The scope of this work has become practically unlimited, embracing all of wet metallurgy and ore dressing, a great deal of chemical and industrial processing and virtually all of sewage treatment, water purification and the handling of trade wastes. Through their use of such common Dorr unit operations as



The Lundberg, Dorr and Wilson gold mill of 1904.

Agitation, Classification and Sedimentation, gold and silver metallurgy are related to such distant operations as sewage treatment, pulp and paper manufacture and the making of beet and cane sugar. In fact, the operator of a copper, lead or zinc concentrator would find himself quite at home running a wet process cement mill or even a wet phosphoric acid plant, so closely have these seemingly unrelated industries been tied together by Dorr unit operations, common to all.

Solving Problems

But the Dorr Company's work is the solving of problems—engineering problems. Its founder, in his youth, helped solve problems in the laboratory of Thomas A. Edison, then solved problems at his own and other metallurgical plants in the West and so the organization he heads has a heritage of problem solving and trouble shooting that motivates its every action. All it really has to sell is engineering services and the cumulative knowledge and experience gained in close to 100 industries on six continents of the globe. To be sure, it has machines—Dorr Classifiers, Agitators and Thickeners—to sell, but these machines, after all, are merely the visible iron and steel embodiments of an underlying engineering service. From top to bottom the Dorr organization is composed of engineers with the engineer's approach even to marketing and the engineer's abiding faith in facts and the knowledge that no two problems are ever the same, solvable with the same formula.

Keystone in the international Dorr structure is the Research and Experimental Station, at Westport, Conn., and the Development Staff, with headquarters in New York, but with its real workshop the far flung plants of many industries where field work is continuous and unremitting. Dorr methods and machines have always been and always will be in a state of continuous evolution and betterment. Any practice, however good, that has been in use for five or more years is regarded critically as susceptible to improvement. In good times and in bad there never has been a let up in a substantially-financed program of research—both pure and applied.

A New Type of Research Plant

When a manufacturer is asked to replace an old and tried machine or process; when a banker or an investor is urged to put his dollars behind a new product or a new process, one question immediately presents itself. "Will it pay and, if so, how much?" The Westport Mill, laboratory, research and experimental plant of the Dorr Company, has frequently supplied the answer to this question.

The idea of laboratories and testing plants for such purposes as these is not new, of course, but the conception of the Westport Mill is. For it took idealism of a high order and not a little courage to break away from the traditional laboratory in noisy urban surroundings and the time honored, dusty, congested test plant and transplant them to one of nature's beauty spots in Westport, Conn., 44 miles from New York City. Here, in rural surroundings, yet only seventy minutes from the city and its conveniences, a man of contemplative, research turn of mind can work and think at peace without distraction and with all the inspiration that trees and brooks and fresh country air can bring.

Here on the site of a pre-Revolutionary grist mill are all the tools of modern scientific research, ranging from apparatus handling a few milligrams and a complete photomicroscopic laboratory, to the experimental plant with its capacity of up to 50 tons per day. Here, too, are the reference library and card files and copies of all reports on all kinds of problems encountered over three decades by Dorr engineers in all parts of the world. Under the Director, a dozen or so hand-picked chemists, metallurgists, physicists and engineers grapple continuously with every conceivable problem in solid-liquid handling, shifting the line of attack from the organic to the inorganic field, from chemical engineering to hydrometallurgy and ore dressing, from gold mining to sewage treatment and so on down the line

The original Westport Mill, first research and experimental station of The Dorr Company.

through scores of industries stimulated by the Dorr brand of research.

It's a strange plant, this Westport Mill, at least to the ancient freight agent at Westport Station—all kinds of materials from everywhere are shipped into it, but apparently nothing ever goes out. One week, it's a few hundred pounds of gold ore from Australia, the next week paper pulp from Georgia, then chemical pigment from New Jersey, turbid river water from Missouri, a dozen carboys of petroleum residues from Texas and even a car load of river silt from Arizona, not to mention a steady stream of more or less conventional chemical and industrial raw materials in one to 25 lb. lots on the way to the mill up the Saugatuck River. But if the ancient freight agent ever checked with the youthful Westport postmaster he'd find that the Westport Mill is the postmaster's best customer with heavy engineering reports mailed at frequent intervals to all parts of the world, followed by bottled samples of what Westport research work has done to the myriad shipments that puzzle the freight agent.

Westport Mill is the mainspring of the entire Dorr engineering philosophy, as a few pertinent examples will show. Detailed tests on an Australian gold ore yielded all the technical and economic data on the project and a complete plant layout. A test program of several months' duration resulted in the world's largest river-desilting plant at the head of the All-American Canal in Arizona where 70,000 tons of solids will be removed daily from 8 billion gallons of water. Much of the research work on manganese and the new metal, beryllium, was done at Westport, as also was the checking of new processes for making titanium pigment treating tannery, bleachery and dye house wastes and the continuous carbonation of beet sugar juices.

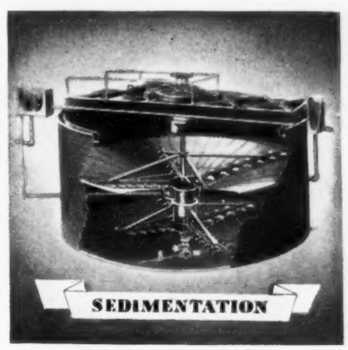
Cement rocks, low in lime and high in silica, at Westport, were made to react to flotation treatment yielding a blended product of any desired lime-silica-iron ratio. Artificial abrasives were ground under controlled conditions finer than ever before for polishing but not abrading fine automobile lacquers. Turbid and hard waters were treated by a combination of mechanical flocculation and recirculation in such a way that a better domestic drinking water is produced and one city saves thereby $50,000 a year on chemicals alone. Sewage sludges were digested under controlled chemical and thermal conditions to yield an inoffensive residue, utilized as a fertilizer, and enough by-product gas to generate all plant power and heat the buildings as well. And so it goes—new problems, new ideas, new solutions—day after day. But behind the scenes, like a theme song of the Dorr organization, there runs year after year a continuous research program on the fundamental scientific facts underlying Agitation, Classification and Sedimentation. If any other company attempted to enter the agitation, classification or sedimentation fields—and there have been some who've tried—it would be thirty-two years behind on research development and cumulative knowledge and experience—a handicap not to be assumed lightly.

Fundamentals

Fundamental research at Westport reveals many freak behaviorisms among industrial materials in the course of the year. Here, for instance, is a 10 micron particle that should settle 105 ft. per hour in water according to formula, yet in actual practice the settling rate is only 1.79 ft. Normally gypsum crystals from phosphoric acid manufacture require 30 sq. ft. of settling area per ton per day, but by altering the conditions slightly only 10 sq. ft. are needed. Take, again, the strange case of some half micron pigment particles that readily overflow a 40 ft. diameter tank yet settle perfectly, later, in a 30 ft. one. Then there are the bituminous coal fines, suspended in water, whose settling rate was accelerated four fold by the addition of a cheap, new, organic coagulant. And, finally, here's a suspension of gluten from starch manufacture that used to settle only to 9.75 per cent. solids, but now, thanks to a special mechanical conditioning, settles to 18.65 per cent.

These are but a few instances, culled from many duly recorded in the Westport archives. And at Westport many years and many hundreds of thousands of dollars have been spent on finding out and recording why such things as these occur, how they can be made to happen again and how the ultra-specialized knowledge thus obtained may be utilized to solve the problems of industry.

With research and problem solving preeminent in the picture, The Dorr Company is engaged in a unique business—the marketing of industrial savings, the marketing of plant performance. This is engineering of the first order, not merely the making and marketing of machinery. The fact that the company is largely known



through such machines as the Dorr Agitator, Classifier, Thickener and countless variations thereof, does not detract from the fact that these machines are merely the iron and steel tools by means of which the problem solutions found in the field or in the laboratory are translated into commercial actualities on a plant scale. "Facts first, then fabrication" has become a watchword, as also has an implicit belief "that there is no substitute for knowledge and experience."

Large Scale of Operations

From the earliest days the Dorr organization has dealt with vast tonnages, applying to their handling continuous production methods somewhat akin to the automotive assembly practices, of which Henry Ford is the chief exponent. As early as 1925 Dorr methods were responsible for the handling of about 80 million tons of dry materials per year, equivalent to a mountain cone 1800 feet high with a base area of 60 acres. The sewage and water treated by Dorr methods was even then about 800 million gallons a day, equivalent to a river 50 ft. wide and 4 ft. deep, flowing at the rate of 4 miles per hour.

A few years later one of the company's imaginative statisticians estimated that Dorr methods were then being used at one stage or another in the treating of 95 per cent. of the gold and silver, 93 per cent. of the lead and copper and 85 per cent. of the zinc mined in North America, equivalent, up to that time, to a 14 ft. road bed of copper, lead and zinc one inch thick, extending from Spokane, Washington to Johannesburg, South Africa, with a 6 ft. x 2 ft. x 2 ft. silver post at the end of each mile and a 6 ft. x 9 in. x 9 in. gold post at the end of every tenth mile.

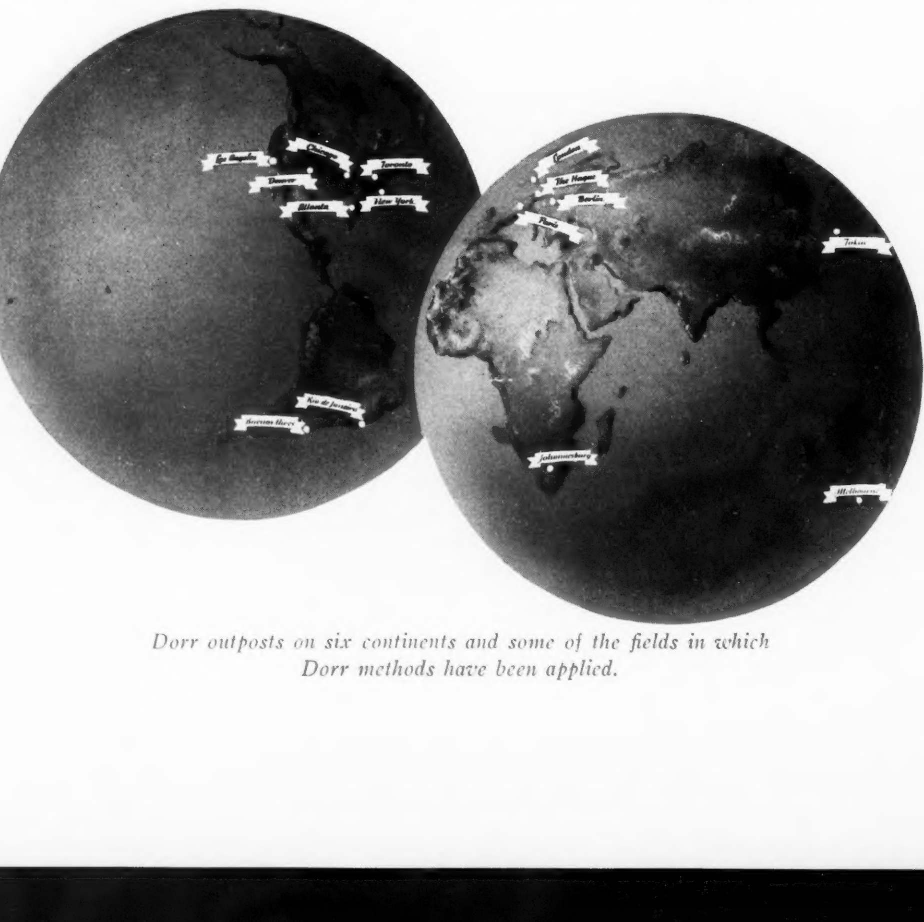
Last year, in 1935, a single Dorr job was contracted for to separate 70,000 tons of solids a day from 8 billion gallons of water, equivalent to a daily train of 1400 freight cars of solids, over 11 miles long, and a flow of water 16 times that of New York City's domestic supply and 1/20th the average flow over Niagara Falls. And another recent project is treating a flow of solids and liquids that would fill the Empire State Building in New York in 17 hours; while at still another plant, a metallurgical one, a Dorr system of closed circuit grinding is permitting the client to grind 13,600 tons of ore per day at the former cost for 8000 tons. Away down at the other end of the scale is a 1935 Dorr pigment plant that classifies and thickens 0.3 to 0.5 micron crystals—so fine that it would take 700 quintillion of them to fill the appparatus in which they are handled.

Corporate Growth

The Dorr Company has grown and expanded the scope of its activities without help from without and the direction of all its functions remains in the hands of men of long experience with the company and well accustomed to working together efficiently and harmoniously. Seven officers and directors have served the company a total of 160 years, eight department heads 107 years and eight branch office managers 106 years. Mere age of the executive staff, in this case at least, has meant no resting complacently on past laurels — no diminution of the urge to grow and the will to experiment.

While the fortunes of the organization have generally followed the changes in business conditions throughout the industrial world, steady progress has been made, even during the last two depressions. New fields of endeavor have always been found as the old ones became saturated and improvements have been made in old techniques to meet the new situations constantly being presented. The success of the organization is probably as much due to sound basic business principles as it is to its knowledge of the laws governing Agitation, Classification and Thickening.

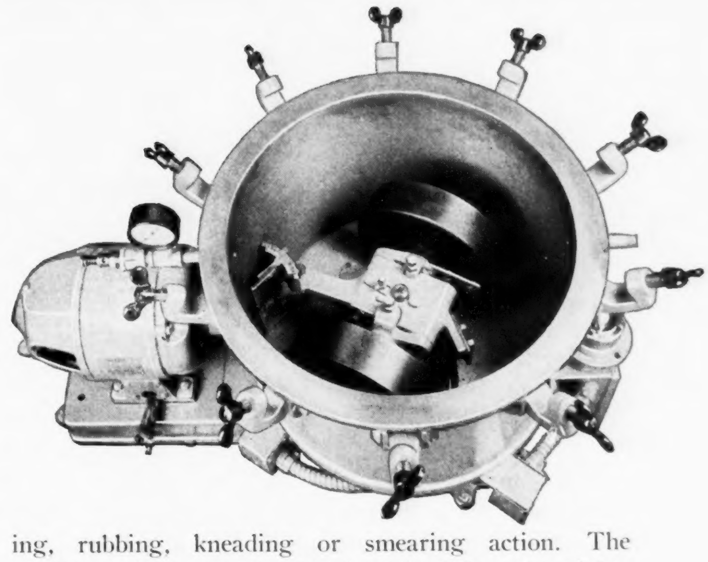
Abrasives
Alum
Barium Chemicals
Barytes
Bauxite
Caustic Soda
Chromium
Clay
Coal
Copper
Dyes
Fertilizers
Gold
Lead
Lithopone
Molybdenum



Nickel
Paper
Phosphoric Acid
Phosphate Rock
Pulp
Salt
Sand
Sewage
Silver
Titanium
Trade Wastes
Vanadium
Water
Zinc

Dorr outposts on six continents and some of the fields in which Dorr methods have been applied.

Mulling Principle of Mixing



MORE than 20 years ago Peter L. Simpson and Herbert S. Simpson conceived the idea of a new adaptation of an old principle of mixing. The development of the idea and improvement in the machines over a period of years resulted in the successful use of the Simpson Intensive Mixer, manufactured by the National Engineering Co., Chicago, Illinois, in more than 3,000 installations. The Simpson Mixer was developed especially for use in the foundry industry for the preparation of foundry sands and in the refractory industry for preparing refractory cements, plastic refractories and firebrick stocks.

In 1932 as a result of the depression new fields of application were sought. It was realized that the mulling principle of mixing on which the Simpson Mixer operates is applicable for a wide range of dry, semi-plastic, plastic and pasty mixing operations.

The investigation of the process industries disclosed a real need for improved equipment for a variety of mixing problems. However, a majority of the process engineers contacted thought in terms of a stirring action when a mixing problem was encountered. The conventional type of rotating paddle or blade mixers were most widely used with few changes in the design of the machines other than a change in the size, shape, number or speed of the paddles or blades.

The investigation disclosed that in general the process industries are interested essentially in uniformity of product with speed of operation of secondary importance. Many of the problems presented offered large opportunities for improvement, both in uniformity of product and cost of producing same. But a mixer was required that would combine speed of mixing with uniformity, and the various blade or paddle type mixers apparently were limited as to what they could accomplish.

The Simpson Mixer operating on an entirely different principle was used successfully on many different types of problems to replace existing equipment, and the economies and improvements possible made it a paying investment to scrap the old style mixing unit and install the new.

The Simpson Mixer, of which there are 7 sizes of batch units, consists of a stationary pan in which is mounted a combination of plows and mullers. These plows and mullers revolve, the plows turning the material over and lining it up under the mullers which impart an intensive mulling, rubbing, kneading or smearing action. The mullers, which are furnished with different weights and sizes for different materials, are adjustable, if desired, to eliminate for all practical purposes any grinding of the materials during mixing. The combined action of the plows and mullers results in a very rapid, thorough and uniform mixing and blending of the materials. In the case of plastic materials, maximum plasticity is developed, while if particles of aggregate are to be coated with a binder, laboratory test and inspection show the particles to be uniformly coated. No "balling" is allowed to take place because of the mulling action.

The action in the Simpson Mixer may be compared to the mixing action in a mortar and pestle or the rubbing of the back of a spoon on the side of a mixing bowl. The materials after being prepared are automatically discharged from the mixer through a door or doors in the bottom of the pan by the action of the plows. Complete discharge usually requires less than one minute.

The latest design production machines are fully equipped with anti-friction bearings positively protected against dust and dirt and thus require a minimum of horsepower. Ordinarily the time of mixing in the Simpson Mixer is ½ to ⅓ the time required in the paddle or blade type machines. This will vary with the materials to be prepared.

Simpson Mixers are variously equipped with steam or water jackets for temperature control. They also are arranged and equipped for mixing under vacuum or pressure. For sticky materials the mullers are equipped with scrapers so that they are self-cleaning.

A number of successful applications of the muller type of mixer have been developed in the chemical and process industries for mixing dry, semi-plastic, plastic and pasty materials.

Scientific Apparatus

The Chemist Must Have Complete Confidence in the Precision of the Tools He Employs

THE Scientific Glass Apparatus Company, of Bloomfield, New Jersey, was established over twenty years ago by William Geyer, who is now the active manager. At first only glass apparatus, worked by hand, for use in chemical laboratories, was produced. The business grew to such an extent that in a few years it became necessary to include a general line of laboratory equipment including chemicals, balances, ovens, microscopes, etc.

The Company, while not claiming the dignity of old age, is an actively-growing youngster, and has assisted to a large measure in the rapid growth of the chemical industry in this country. While not associated directly with the progress of chemical manufacture and the assistance this progress is rendering to everyday civilization, the company has contributed to this progress by offering to the research chemist the apparatus necessary for working out his problems.

This glassblowing field should not be confused with a foundry where glass is handled in the molten state, and various objects are fabricated with the aid of moulds and machines. Glassblowing is a highly specialized field, using only man-power, and to each individual belongs the credit for his own creation—not to the inventor who devised a labor-saving machine.

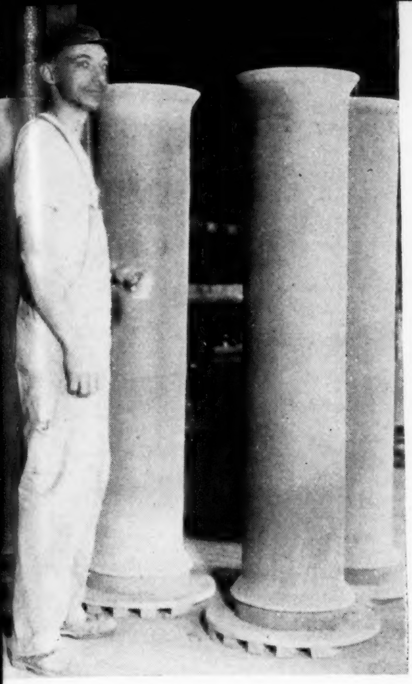
"Service" has been the watchword of the Company since its inception. This, coupled with high merchandise standards, has raised it to an enviable pinnacle as a reliable source of supply.

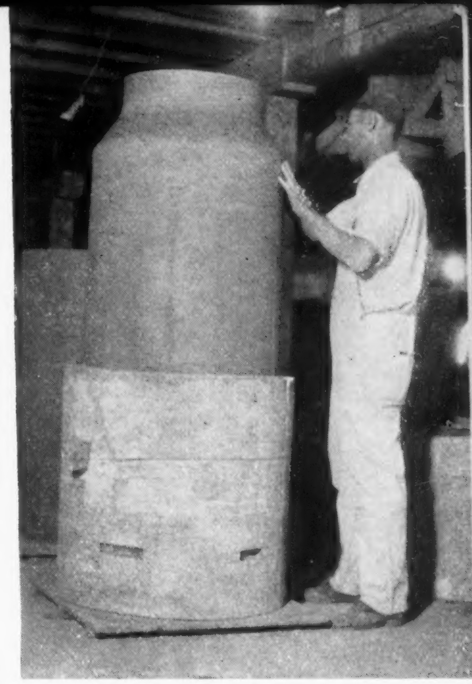
The manufacturing division is composed of glassblowers, and grinders—"artisans of the highest calibre." To the layman, the sight of a glassblower seated at his bench, with nothing but a burner and a piece of glass tubing in his hand, is really thrilling. But still more thrilling, as he watches the apparatus materialize out of practically nothing, is what can be accomplished by this ancient handicraft.

The Scientific Glass Apparatus Company is justly proud of the work it has done, for it has given to the chemist apparati which are time savers in his daily routine, and assure him of accuracy, so that no hesitancy, even for a moment, is necessary in his calculations.

The Company stands ready at all times to assist the busy research man with his problems, and to this assistance and service which it is prepared to render, it will owe its future growth.

The manufacturer of scientific apparatus is under a sacred obligation to the chemist to provide him with tools of unerring exactitude and precision.

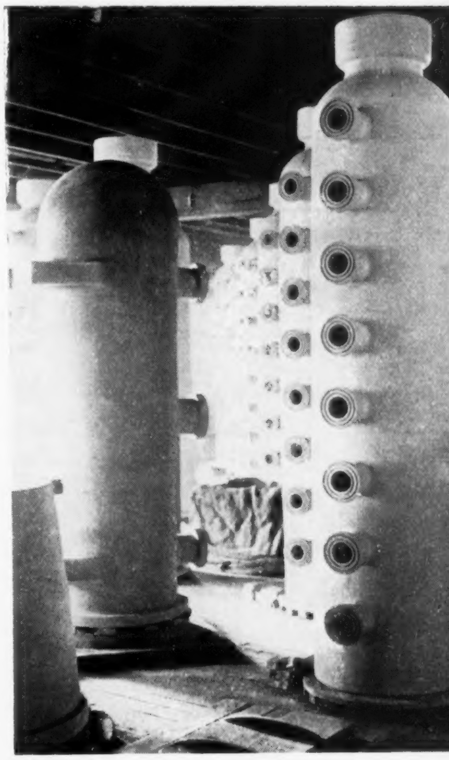




"It Is The Body Itself"

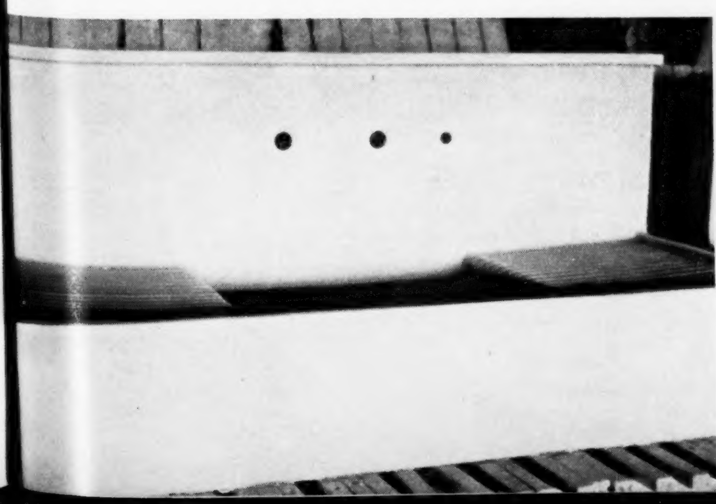
The Story of Knight-Ware

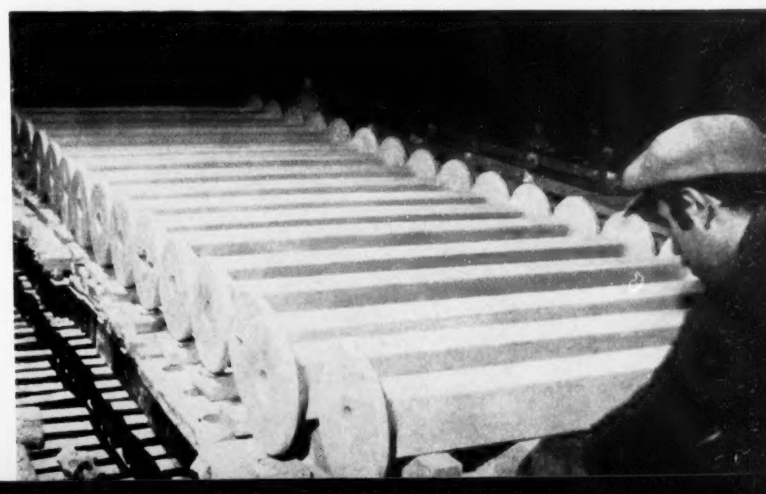
EACH member of the graduating class of 1906 at Buchtel College had a special project to develop as a part of their last year's course. The eldest son of Dr. Charles M. Knight, professor of sciences at that time, chose to study the geological and chemical aspects of Ohio Clays. Many other members of that class went into the rubber industry and into professions. Maurice A. Knight went with the A. J. Weeks Chemical Stoneware Pottery where he had previously spent some summers working as a common laborer. The Weeks Pottery was one of the very first to manufacture chemical stoneware equipment in this country. In 1908 he was superintendent and a salesman. In 1909 he did all the office work and selling. In making trips to chemical plants in Niagara Falls, Cleveland and Chicago he had many opportunities to see various kinds of stoneware equipment. At that time, the little chemical stoneware that was made in this country was heavy and depended on an applied glaze to hold chemicals. Stoneware imported from England and Germany was thinner, vitrified and not always slip glazed. The only reason American stoneware was used in chemical plants then was because of cheaper prices and quicker delivery. It was not, however, very satisfactory.



In 1910 Maurice A. Knight bought a small pottery, on the land the present factory stands, to make chemical stoneware as he thought it should be made. It was bought on a land contract basis which meant that if a single payment lapsed he would lose everything. Common pottery such as jugs, butter crocks and jars was still the main volume product. On several occasions to meet payroll and accounts Mr. Knight would help load a car with merchandise, rush off to Detroit or Cleveland, call on grocers, hardware stores and liquor houses, sell his product, hire a cart and wagon to deliver his sales, collect cash and return to keep his plant going.

It was hard going in those early days. Knowing the difficulties experienced with the American semi-vitreous glazed stoneware, and possessing a technical knowledge of both clays and chemical processes, Maurice Knight





Knight's display at the Chemical Exposition held in 1935 at the Grand Central Palace in New York City.

first set out to make stoneware that was vitrified all the way through, that did not depend on a glaze for acid resistance, and that was tough enough to be formed into large pieces of equipment. He obtained this with comparative ease. Since it was different than chemical stoneware then made in America, his slogan was and is now "It Is The Body Itself." The hard job was to sell it. His entree into the chemical manufacturer's plant was not only hampered by the poor reputation of American chemical stoneware, but the chief engineers of many plants being foreign born could see nothing but English or German made equipment. In many instances one or two pieces of his ware were on trial from six months to two years in a system before the company was convinced that finally chemical stoneware was available in America that was the equal of any imported. The business did grow. Mr. Knight knew what he was talking about, and his customers soon found out that what he claimed was always backed up. There were comparatively few customers in those days but when they built a plant, they used a lot of chemical stoneware. Nitric acid was made then in stoneware, and towers and bench receivers were sold by the carload. Sulfuric and muriatic plants used lots of stoneware and there were new plants all the time. Some of Knight's first customers are customers today—Charles Lennig, Harrison Brothers, Pennsylvania Salt, Grasselli Chemical, Mathieson Alkali Works, etc.

Four Times in Five Years

In five years' time, a good product and honest intelligent service had quadrupled the size and capacity of the Knight plant. During the war, practically the entire output of the plant was turned over to the government. There was neither time nor man power enough for expansion and the little plant was pushed to capacity. The war was almost the finish of the business. Selling prices had not increased at a rate corresponding to increases in raw material, coal and labor. After the war, the market was flooded with excess chemical stoneware in government plants. It was good until broken. The depression of 1921 was serious. Finally, in 1923, a much needed new market was opened with the pushing of chemical stoneware piping and sinks for laboratories. The original sinks and piping installed in the laboratory of the local University in 1910 are still in use. In the building boom between 1926 and 1929, "Knight-Ware" was installed in many of the largest laboratories and hospitals in the country.

Another new development that was worked out with the Grasselli Chemical Company was the porous carboy stopper. A stopper that would not permit acid to escape but which would allow gases to vent meant an end to the danger of carboys blowing up. Proper clay mixtures and machines for this were worked out in Knight's plant, and shortly thereafter the I. C. C. made the stopper mandatory equipment.

Depression Developments

Being a capital goods manufacturer, Knight was hard hit during the last depression. Four new developments, however, were brought out by Maurice A. Knight between 1932 and 1935. The first of these was the use of a deairating machine in preparing clays and extruding shapes in chemical stoneware. This meant an improvement in body structure beyond that possible by blending and firing of clays. Better and more efficient equipment could be made. Cooling coils, for instance, with 1/8" wall thickness were practical now. A 100 ft. length of pipe can be wound on a frame and burned successfully.

The second was not stoneware but was developed to be used with chemical stoneware tile as a lining for large vessels. "Pyroflex," as the material is named, is a flexible, non-tacky, non-aging material which is resistant to the action of mineral acids and their salts. It forms a continuous leak-proof lining over concrete, wood or steel. It has been used alone for caustic soda and muriatic acid storage. With "Knight-Ware Tile" it is now in service in boiling tanks, bleach towers and pickle tanks. It has possibilities of many applications in corrosive work.

Selling Drums

The third item is solely a merchandising set-up for distributing an acid shipping container. The "General All-Rubber Drum" fits in with the Knight Sales set-up. It even comes under the slogan, "It Is The Body Itself." Its design and all-rubber construction make a lightweight, acid-resisting, practically indestructible shipping container.

A reputation of a quality product and integrity in business brought Mr. Knight and Dr. Ernst Berl together two years ago. After much work Mr. Knight designed a machine for making and is now marketing Dr. Berl's ingenious invention, "Saddle Filling Material." Chemical stoneware tower packings have long been in use as a surface medium in place of quartz, coke or brick. The ideal filling material should have a well distributed maximum effective surface per unit volume and still offer a minimum of resistance to gas and liquid flow. The Berl Saddles excel any manufactured packing in this respect with the added advantages of minimum channelling or clogging and reduced side wall pressure. This material has its applications in scrubbing, reaction, fractionating and drying towers

and wherever intimate surface contact is advisable. They have to be made in great quantities cheaply and it is a difficult form to shape and handle.

Manufacture of "Knight-Ware"

Briefly, the steps in making "Knight-Ware" are as follows: Selected raw clays are washed, screened and filtered to remove twigs, stones and soluble salts. A stock of filter cakes is kept up on each type of clay and various batches are mixed in a wet pan to the correct plasticity. These batches are then aged in storage bins to improve the working strength of the clay. Before being sent to the workmen it is then pugged or put through the vacuum machine for final tempering. Brick, carboy stoppers, tile, tower packings and pipe are formed by machines. Piping is finished by hand. Other equipment is entirely hand built by skilled workmen. Some pieces are formed with the aid of plaster molds, others without. The old-fashioned potter's wheel works right beside a lathe in making valves. Sinks and tanks are formed much as a cabinet maker would work with large pieces of wood.

Ninety per cent. of the machinery in Knight's plant is devoted to the preparation of clay mixtures. It is easy to make a clay vessel acid-proof by using the right clay and vitrifying it. Knight's goal has always been to make the large special shapes true to measurements and mechanically suitable for service. The type of clay, the method of preparation, the method of forming and the process of firing all have an important bearing on the quality of the finished piece in service. The casual observer may look at several pieces of stoneware made today and say what's the difference, they are all made of clay. He has only to look at the corners of a fairly intricate piece, check its dimensions, and if workmanship isn't apparent put it into service to find out the difference. "Knight-Ware" has fourteen basic body structures which are used depending upon the service conditions the equipment is to meet. A carboy stopper is open and porous. A valve has a body structure that approaches glass.

Set for Burning

After a period of careful drying the piece is set in a kiln for burning. This stage takes two weeks' time and is as important as any other for best results. A plain salt glaze is put on during this stage. It is merely a fusion of the surface to give the ware a smooth finish and is the most durable of any ceramic finish known. After being drawn from the kiln, the piece is tested with air or water or both and examined for defects. If grinding is called for, this is done with carborundum. For shipping, the pieces are packed in straw-filled crates. An idea of the sizes of equipment is given when one-piece sinks three feet wide and eight feet long with a back have been made and shipped. Pipe from 1" bore to 60" bore are available. Jars and kettles of 1 and 200-gallons capacity are in common use and have been made as large as 1000 gallons capacity. 8" bore lubricated plug valves, 96" long rollers for carrying strip steel in picklers, and 5 ft. and 6 ft. lengths of pipe with a tolerance of 1/8" in straightness help keep the production department on their toes.

Markets

Since England, Germany, France and Japan have chemical stoneware plants, our market is limited to the United States and Canada with occasional shipments to South America, Mexico and China.

Formerly, the heavy chemical manufacturers took 95 per cent. of our output. Now, what we broadly term the "user" of chemicals takes the bulk of our output. Our customers now can be found, if only in a small way, in nearly every industry going. Steel, textiles, fine chemicals, drugs, oil, food, pulp and paper, printing, artificial silk, paint and varnish and many specialty processes such as plating, photography, etc., use some of our equipment. Besides being immune to acid corrosion, it will not contaminate, is extremely hard, and is an electrical insulator. Its enemies are hot caustic, hydrofluoric acid and severe temperature changes. Otherwise, if treated with moderate care, it will last indefinitely.

Organization

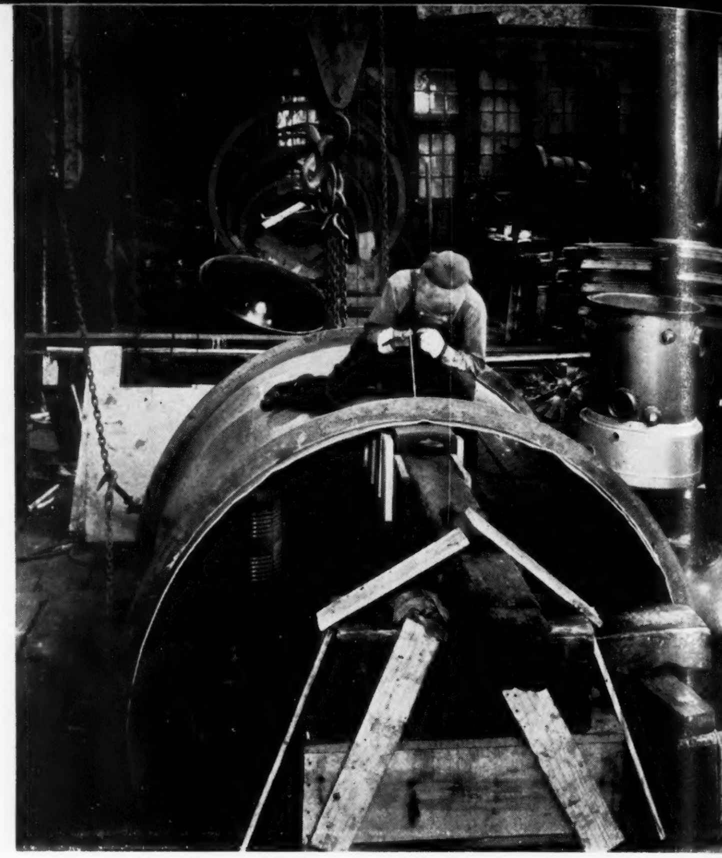
Many of the workmen in the plant have been with Mr. Knight from the start. Others have been in service at least 15 years. There are many sons learning the trade. There is no piece work, all are on their honor to turn out the best work they know how. The "boss" is known as Maurice. Charles Dennison, the plant superintendent is a "Charter Member." Earl O. Boedicker, General Sales Manager, started 17 years ago. Harrington Proctor, Secretary and Treasurer, can count 12 years' service, R. B. Brewer, Purchasing Agent, 14 years. C. A. Rauh, Manager Pyroflex and Rubber Drum Sales, 3 years. Maurice A. Knight, Jr., Advertising Manager and salesman has seen 5 years service. Maurice A. Knight, President, General Manager and sole owner is active, progressive, cheerful, optimistic. He maintains a New York office, has representatives in Philadelphia, Buffalo, Cleveland, Detroit, Chicago, St. Louis, Dallas, Los Angeles, San Francisco, Toronto, Montreal.

The company's exhibit at the Chemical Show fourteen years ago.

Since 1788

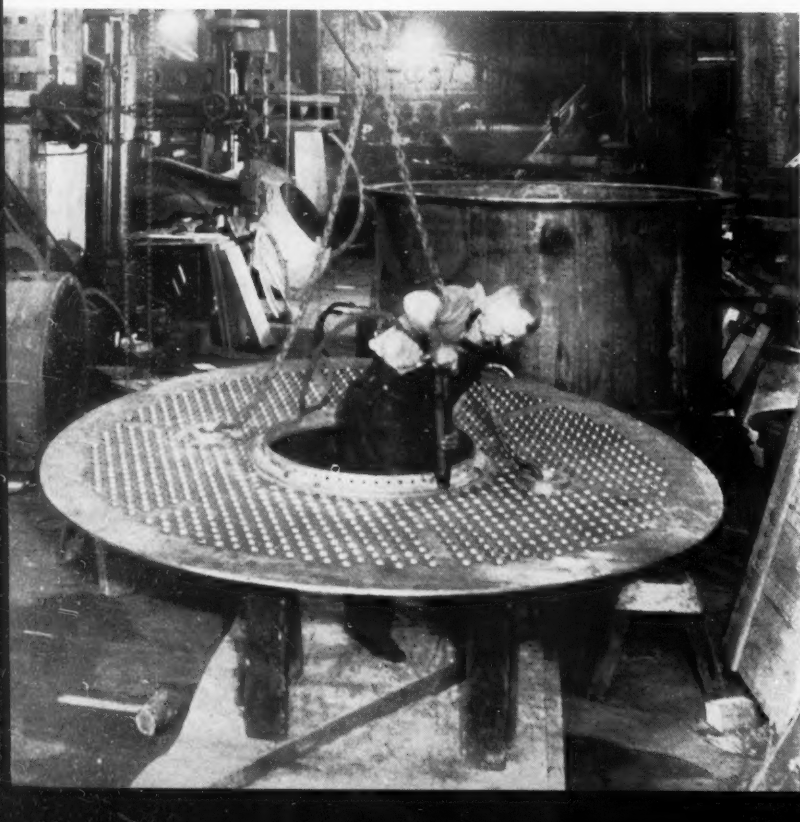
Metal-Workers

for Chemical Industries



WITHIN just two years of a century and a half ago, Joseph Oat, master coppersmith, opened his shop at 232 Quarry Street, Philadelphia. Though that shop has been largely expanded by the purchase of land through to Cherry Street and of adjoining lots giving frontage upon Bread Street, the address still remains 232 Quarry Street. For over a century the firm has been known as Joseph Oat & Sons. Throughout its long history the essential character of the business has been the same. "Oat" has become a synonym for fine, made-to-order metal work for the chemical process industries.

Joseph Oat was just such a metal craftsman as is described in the historical introduction to this volume, and as in those days Philadelphia was chemical headquarters so among his regular customers were Harrison Brothers, sons of the pioneer, John Harrison, Charles Lennig, Powers & Weightman, and Rosengarten & Sons. Oat made the copper drying pans for the white lead made by Charles Wetherill and John T. Lewis, and it is significant that his firm to this day does metal working for all these firms or their legal successors. In this same tradition of long, faithful service, one of Oat's first customers was the Francis Perot's Sons Malting Company, established 1677, now the oldest firm in Philadelphia.



In the early days the work of the shop was regular custom coppersmithing. They were specialists who deemed iron and tin and brass—then the only other industrial metals—as outside their domain. Besides work for the chemical plants, they served breweries and the shipyards and later the railroads. Pans and kettles and tanks, boiler tubes and coils—these were the commonly fabricated apparatus.

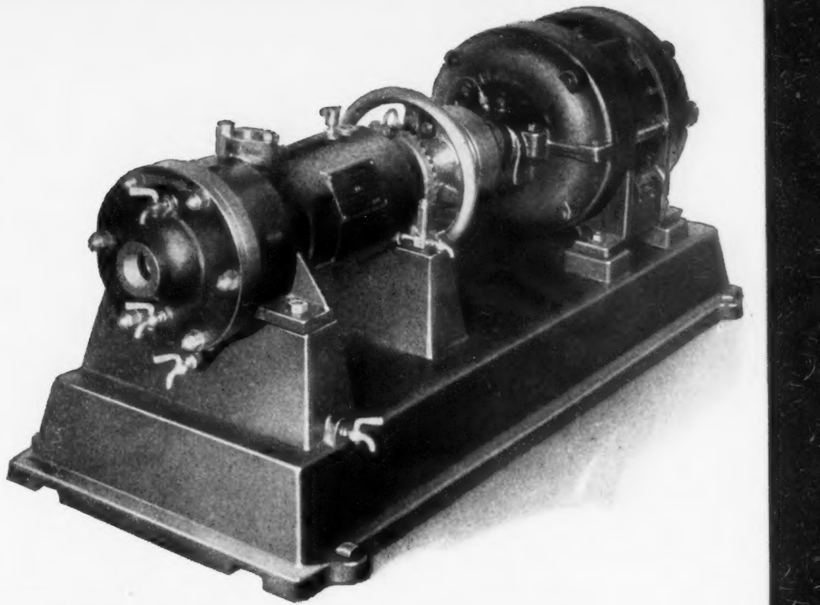
About 1884 sugar evaporators began to be made. Ever since, this old firm has been famous for all sorts of vacuum apparatus for a wide variety of uses. During the World War the shop was virtually turned over to Government work, and a notable achievement was the production of all the copper piping for one hundred and fifty ships.

Since the World War a basic change has come. Copper from being the exclusive material has been largely replaced by other metals and many alloys. Silver was the first intruder, and silver was first used in making some special, corrosion-resistant, chemical apparatus. Now nickel, aluminum, monel, stainless steel, and all the host of the modern alloys are regularly worked. Nowadays it almost seems as if everything but copper was used, yet there is no day when some copper-working job is not on hand.

Men build business enterprises and men only can carry on the tradition of fine craftsmanship. Joseph Oat was succeeded by his son Charles. In 1880 a nephew, Charles Oat Beaumont, assumed control which he in turn passed on in 1928 to a younger man, Walter Schoeni, who had literally grown up in coppersmithing. Under him this 148-year-old business continues to grow lustily year after year.

Colloidal

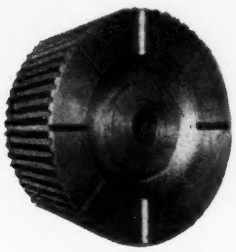
Dispersions, Emulsions and Suspensions



Charlotte Colloid Mills are constructed in various sizes including a laboratory model and are constructed in stainless steel, nickel, monel metal, bronze and cast iron. Illustrated is the No. 50 commercial size machine.

THE Charlotte Colloid Mill derives its name from the pleasant, progressive Southern city of Charlotte, North Carolina, for there it was that the revolutionary engineering principle of a grooved, conical Rotor revolving at high speed within a correspondingly grooved, conical Stator was perfected over ten years ago, a development that has profoundly altered industry's viewpoint on disintegration and emulsification operations in the past decade.

Where previously chemists viewed with considerable apprehension the physical state of many finished emulsified products and specialties, they discovered that the use of a Charlotte Colloid Mill in the manufacturing operation resulted in a really more permanent stability in the finished product.

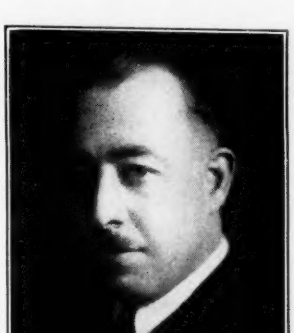


The Charlotte Principle-Grooved Rotor and Stator.

The Charlotte Colloid Mill is essentially a high speed disintegrator and emulsifier in which immiscible liquids, liquids carrying solids in suspension, and pastes are finely dispersed, disintegrated and homogenized.

The patented Rotor-Stator principle, in every detail a purely American invention and a notable contribution to the advance of American chemical progress, is the heart of the Charlotte Colloid Mill. The clearance between Rotor and Stator is regulated by an adjustment device. This adjustment device is external, and, therefore, the setting of the Rotor and Stator may readily be changed to meet various requirements without dismantling the mill. The materials to be dispersed, disintegrated or homogenized, are piped to the inlet of the mill, and then automatically forced through the small gap between Rotor and Stator by means of a self-contained internal pumping arrangement which is integral with the end of the Rotor.

The Rotor and Stator of the Charlotte Colloid Mill, being of specially grooved design, do not depend to a great extent upon the forces of hydraulic shear, but rather to centrifugal force in combination with a chopping and churning effect, or a mechanical shearing action. The result is a terrific impact action which may be moderated by changing the adjustment to suit the type of material being processed. Since the mill employs both the forces of hydraulic shear and impact action, the products thus treated are divided into exceptionally fine particle, or globule size.



George H. Rider, Founder and President, Chemicolloid Laboratories.

The use of the Charlotte Colloid Mill is a definite assurance of continuous production and, therefore, better plant control, as well as a guarantee of high degree of superiority and uniformity for the finished products. The versatility of the Charlotte Colloid Mill is one of its most remarkable features. Hundreds of machines are successfully operating in the chemical, food, cosmetic, pharmaceutical, paint and pigment, rayon, rubber, paper, dyestuffs and ink industries. Manufacturers of household specialties, chemical textile specialties, and asphalt and tar emulsions, etc., have found that the use of the Charlotte Mill eliminates much old-fashioned, unsatisfactory bulky equipment.

The importance of the personal equation factor is often under-estimated by manufacturers when purchasing equipment. Many in fact consider price first and subconsciously view performance and service as secondary considerations. The Chemicolloid Laboratories, Inc., has the temerity to state that the Charlotte Colloid Mill will not perform miracles but is a very useful machine, the mechanical action of which when used in conjunction with a knowledge of chemistry and formulation of products has made it invaluable to the process manufacturer. Their interest does not rest solely in the sale of equipment, but in the satisfactory performance of their Charlotte Colloid Mill in the plant. For this reason the company has performed considerable experimental work on products for old and prospective customers in order to supply correct manufacturing information and to safeguard Charlotte Colloid Mill users from placing products on the market which later may develop serious defects. The research, engineering, and service departments of the company are thoroughly imbued with this clear conception of their responsibilities. Such is the business creed of George H. Rider, president of Chemicolloid Laboratories.

LEAD IN INDUSTRY

The Andrews Lead Company and The Lead Lined Iron Pipe Company Working Cooperatively Offer Lead Users a Complete Service

THE ancient alchemists toiled endlessly in crude laboratories, imbued with a fanatical desire to produce, in some miraculous manner, gold from lead. Today modern science continues the century old quest. In the meantime, the lead manufacturer has succeeded, through his study of the invaluable uses for this humble metal, in giving the world at large greater value perhaps than if a measure of success had been reached by the ancient alchemists.

In 1919 and in 1890, two men of vision, Bob Andrews, recognized as a leading authority on lead, and T. E. Dwyer, Sr., who knew lead intimately through plumbing work, started separate enterprises in the manufacture of lead and amalgamated lead and iron products.

Bob Andrews' venture started with a modest plant on the site of the old Penny Bridge in Long Island City. T. E. Dwyer, founded his plant in the quiet town of Wakefield, Massachusetts, a suburb of Boston.

Years of inspired effort followed. The wealth of experience accumulated by Mr. Andrews and Mr. Dwyer, together with untiring effort and endless energy, resulted in immediate and favorable recognition by the chemical industries.

The glory of notable achievement and profit from intelligent study of the needs of those they strove to serve spurred them onward.

What had started as two modest enterprises assumed important proportions. Redoubled effort, expansion of manufacturing facilities and the passing of time caused

the names of the two companies to become increasingly important as desirable and dependable factors in the lead industry.

There are many and varied phases to the lead business. This metal and its alloys are employed in countless industries, in each of which some special feature in the production of the product requires intensive study to insure its proper perfection.

To attempt to specialize in the production of lead products for each of these industries would result in a lack of specialization. With this knowledge, it was the independent decision of both Mr. Andrews and Mr. Dwyer to concentrate all their energies and resources on the fabrication of lead and amalgamated lead and iron products for the use of the chemical industry.

When men such as these, backed by the facilities which they had created, determined to specialize in this division of the lead business, the result was products of superior quality eagerly sought by a receptive market.

By about 1930, the Andrews Lead Company of Long Island City and the Lead Lined Iron Pipe Company of Wakefield, Massachusetts, had acquired the most modern facilities available to manufacture the complete line of lead products.

The Andrews Lead Company produced all types of sheet lead, lead pipe, lead wire, rod and bar, came lead, lead fittings, lead wool, lead castings, shapes and forms, lead covered electrode wire, lead flanges, lead tubing, litharge and red lead.

The Lead Lined Iron Pipe Company manufactured lead and tin lined and covered pipe, tubes, coils, valves, fittings, fans, cocks, bends, impellers, propellers, tanks and pumps.

It was about this time that the two companies decided to work on a cooperative basis, so that either of them, individually, would be able to take complete care of any customer they might have and this type of cooperation continues in force today.

There was one great service which remained to be accomplished for the lead users in the chemical industry and this was to assist with the actual design of construction, develop the installation of lead, and reduce the cost of maintenance on lead work, so that the metal would be the most economical, dependable and simple method of solving the intricate and varied problems with which it was brought in contact.

With this thought in mind, the Andrews Lead Company started an installation and maintenance division. It acquired the services of several of the leading lead engineers available. These men had built, supervised and maintained innumerable lead installations throughout the country and were most familiar with proper construction and maintenance procedure.

This development met with an immediate and remarkable response from the most important consumers of lead products. New methods of construction, new applications for lead, reduction in construction costs, ease of maintenance and increased performance were some of the most important advantages which were developed.

The extensive research work carried on by the chemical industries developed new products and processes, which in turn demanded fabricated pipe, valves, tanks, etc., that could efficiently withstand the extreme corrosive action of acids, where extreme temperature variations, vacuum, and pressures were involved.

The Lead Lined Iron Pipe Company pioneered homogeneous lead lined and covered products under the trade name "Wakefield Amalgamated" that met these conditions of temperature—close to the melting point of the lead itself; of vacuum—within all practical limits; of pressure—the limits of steel and iron castings. Lead homogeneously bonded or amalgamated to steel, iron, or copper meets conditions where lead pipe, lead castings and sheet lead are limited due to the physical properties of the metal.

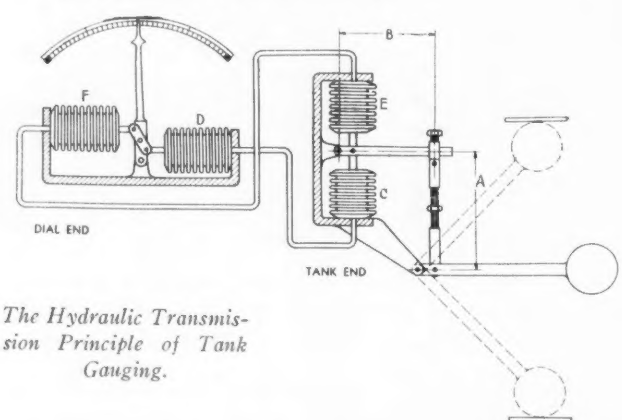
Today the Andrews Lead Company and the Lead Lined Iron Pipe Company ship their products to industrial companies located anywhere in this country. The Andrews Installation Division is equipped to successfully install the largest and most complicated installations, no matter where they are located and also arranges maintenance work, wherever required.

Left, an interior view of the Andrews Lead Company's plant at Long Island City showing the sheet rolling mill; right, a section of the Lead Lined Iron Pipe Company's plant at Wakefield, Mass.

The Hydraulic Transmission Principle of Tank Gauging

THE Liquidometer Company was founded in 1923 to satisfy the need existing in the oil burner, marine, aircraft and industrial fields for tank gauges that would overcome the inherent inaccuracies in the instruments then available. Leadership was quickly achieved, and in 1928 it became necessary to add additional capital to the rapidly expanding business and to obtain larger manufacturing quarters. At the same time the corporate name was changed to the Liquidometer Corporation.

The company spent considerable time and money in experimental work on every form of tank gauge for indicating liquid levels at a remote point, including the hydrostatic and electric principles. This research indicated clearly the necessity of a radical departure from any of the then known principles, and led to the perfection of the Liquidometer patented hydraulic transmission, which makes possible the building of tank gauges unaffected by temperature, pressure, vacuum, etc., and the elimination of pumps, valves, pulleys and all manual operation. In addition, it permits the use of a most desirable type of pointer and dial (and, when needed, continuous recording systems) instead of a glass tube indicator. The new principle brought to industry an entirely new conception of distance reading tank gauge efficiency and accuracy.



The Hydraulic Transmission Principle of Tank Gauging.

The schematic drawing explains the balanced hydraulic transmission used in Liquidometers, but does not necessarily represent the actual construction. Metal bellows "C and E" located at the tank or transmitting end are rigidly supported at one end by a suitable bracket. Opposite ends of these bellows are connected to each other by a solid piece. These bellows "C and E" are connected by tubing to bellows "D and F" at the dial or indicating end. The dial end bellows are each supported on one end by a bracket which also provides a bearing connection for the indicator pointer. The two circuits are filled under vacuum with a liquid, thus providing two separate hydraulic circuits. Operation of the system is as follows: When the float moves, as for example, down, the mechanical linkage between the float arm and tank end bellows causes bellows "C" to compress, thus displacing a portion of the liquid therefrom by way of transmission tubing into the bellows "D" in the dial end causing it to elongate. At the same time, bellows "E" in the tank end is caused to be elongated and takes in a portion of liquid getting its supply through transmission tubing from bellows "F" in the dial end, causing bellows "F" to contract. Reverse takes place when the float is moved up. Temperature compensation is taken care of by means of a link arrangement at the dial end.

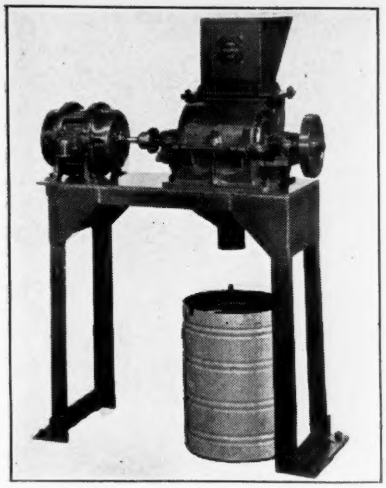
A Complete Line of Liquid Level Gauges

Space does not permit a detailed résumé of the complete line of Liquidometer equipment for liquid gauging and controlling. In addition to the remote reading gauges with the exclusive hydraulic transmission principle, a line of direct reading Liquidometers are manufactured. They are totally unlike any other direct reading type gauge, in that they effectively seal, through the ingenious use of metallic bellows, the gauge from the tank, thus preventing the escape of liquid or gas. The importance of this feature in the chemical and process industries where volatile, flammable or otherwise hazardous liquids are used, is, of course, quite obvious to the plant manager and has led the safety departments of several chemical companies to suggest to their manufacturing divisions the advisability of installing Liquidometers. Hydrostatic tank gauges in a number of different models and with the desirable dial reading feature are also manufactured for applications where the hydrostatic method is satisfactory.

Attachments (simple alarm devices) can be added to all Liquidometer gauges to inform plant workmen when predetermined tank levels are reached, either by the use of lights, bells, or the cutting in or out of motors. Dial readings or recording charts can be arranged to suit individual requirements.

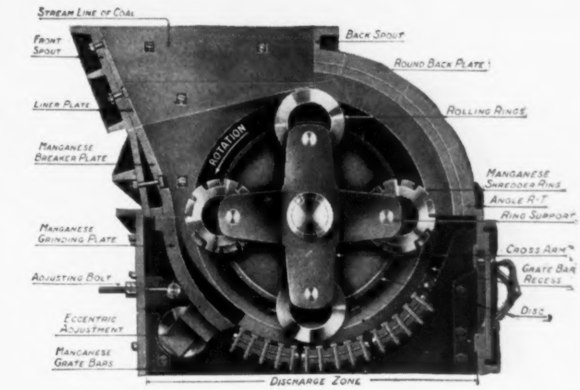
Liquidometer and Levelometer tank gauges provide plant executives with a constant check on inventory; eliminate inaccurate and dangerous "gauge sticking" or taping methods; reduce or eliminate fire and labor hazards; permit gauging of tanks without loss of pressure or vacuum; and provide accurate check on consumption and deliveries. Weighing operations can often be eliminated in manufacturing; instead, Liquidometers for determining quantities entering batches are employed.

Liquidometer engineers are continually asked to solve special problems in liquid gauging, to design new equipment, or to arrange novel adaptations of standard models to fit unusual conditions. The adoption by the U. S. Navy Department in 1927 and the continued use of specially designed models for use in submarines and other vessels attests their accuracy and dependability under unusually severe conditions of service. Liquidometer gauges are favored not alone for their high degree of accuracy, but also because of the extreme ease with which they are installed. The engineers of the company welcome the opportunity of discussing with plant executives special liquid level gauges or controlling problems.



A typical laboratory unit.

Rolling Ring Principle of *Crushing*

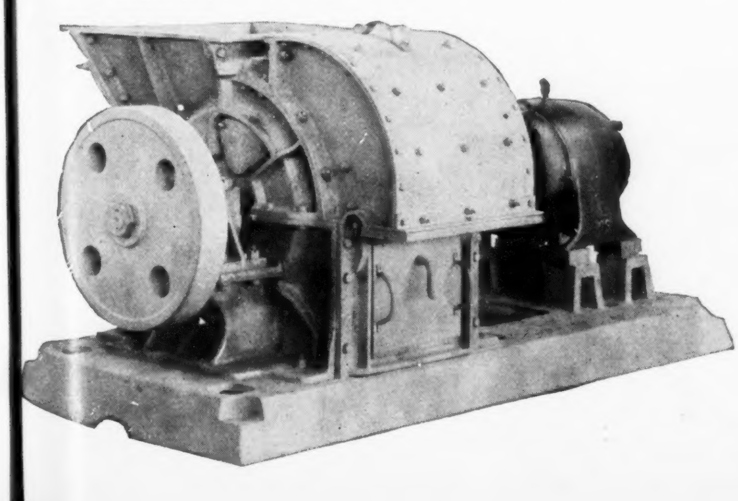


The American Ring Crusher.

THE revolutionary idea of the rolling ring principle of crushing was perfected and introduced to industry by the American Pulverizer Company in the year 1908. For several years thereafter, the equipment was manufactured by an outside machine shop from designs prepared by American Pulverizer's engineers. In 1917, however, the company found it necessary to enter the actual production field. Now all divisions of the company are located in a modern factory in St. Louis.

The basic engineering principle employed in American Ring crushers, small as well as large, is very easily understood. Centrifugal force is used at right angles to a horizontal shaft. The material entering the crusher from the top, falls on and is struck by the rings in suspension. This action of the rings, shattering and distributing the raw material being processed before it reaches the breaker and grinding plates is the why and wherefore of the low cost per ton of finished product which has characterized all American Pulverizer Company's installations and the factor which has made the rolling ring principle of crushing so popular in the chemical and processing fields.

Quite naturally the first and even today the most important use for American Ring crushers is in industrial plants for the reduction of coal to stoker size. Thousands of installations operating under varied conditions have proven economical, the cost running well below two cents per ton, including maintenance, power, labor, depreciation and interest on investment. Breakdowns are unknown when rugged American Ring crushers are used. The flexibility of the rolling ring system protects the machine from injury from foreign material.



The instant success of American Ring crushers in the field of coal processing brought a number of other crushing problems to the engineering department of the company for satisfactory solution. As a result the company's engineers have had wide experience in the chemical and process industries, particularly on such materials as the following:

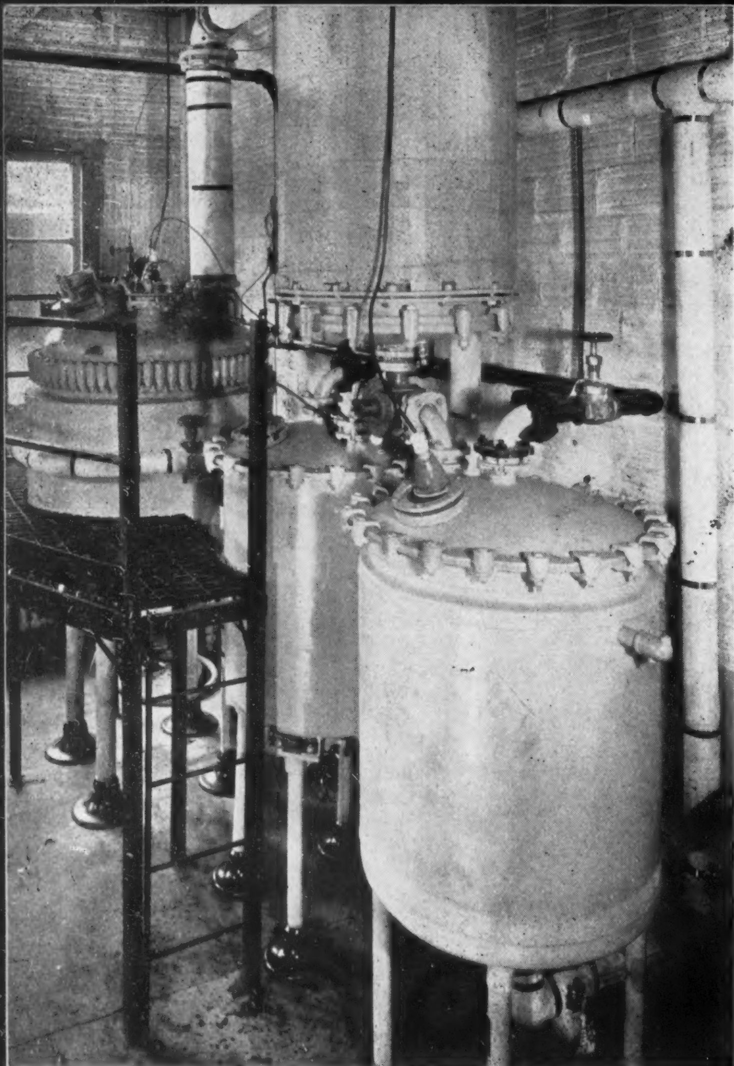
Alum
Asbestos
Asphalt rock
Bakelite and other resinous materials
Barytes
Bentonite
Bones
Borax
Carbon
Charcoal
Cinders
Clay
Coke (from coal or petroleum)
Corn
Cottonseed cake
Cracklings
Culm
Expellercake
Fire Clay
Fishscrap
Fullers' Earth
Fertilizers
Garbage
Glue
Gypsum
Gravel
Insecticides
Iron Oxides
Kaolin
Lignite
Lime
Limestone
Litharge
Marl
Mica
Magnesite
Malt
Manure
Naphthalene
Nitre cake
Nuts, shells
Oil cakes
Oxides
Oyster shells
Paint, coldwater
Paper
Phosphate Rock
Pigments
Pitch
Potash
Pumice
Pyrethrum flowers
Roots
Rosin
Rockwool
Salt
Shale
Shellac
Sewage, dried
Sienna
Slag
Sulfur
Tankage
Tobacco stems
Waxes
Wood chips, flour

One of the most valuable contributions of the company in recent years has been the introduction of a smaller, so-called laboratory size, rolling ring crusher, grinder and shredder, incorporating all of the engineering features of the larger equipment, a piece of machinery that enables the small manufacturer, as well as the large, to crush or reduce materials at a very small cost. Yet the equipment occupies no more space than an ordinary office desk when installed with motor ready for operation. The large manufacturer often finds the apparatus invaluable for laboratory purposes or for testing trial batches and can be sure that any results obtained in experimental work can be duplicated exactly in actual operating practice. The laboratory crusher is manufactured in two sizes and the larger apparatus in several sizes and designs to meet special requirements.

The American Pulverizer Company also manufactures a complete line of hammermills that are suitable for reducing a large variety of materials.

The "S" Type, latest addition to the American Pulverizer Line of Ring Crushers and Pulverizers.

What Glass Lined Steel Equipment has Meant to *the Process Industries*



Completely glass lined distillation assembly at John Wyeth & Bro., Philadelphia, Pa., used for the extraction under high vacuum of an alkaloidal solution.

THERE was a time when a few simple reactions and fewer raw products constituted the "process industry." That was about the time of John Winthrop, around 1631. Much has been written about his contribution to industrial chemistry in those pioneer days. Had research failed its purpose, life would have remained as simple, if not as enriched.

No one can discuss the contribution of equipment manufacturers without acknowledging the contribution of the metallurgists, chemists and engineers. All three professions are identified with the manufacture of glass lined steel equipment which recently passed its 50th birthday. Its origin came about in a search for something quite different as so many things do. The first glass lined tanks were manufactured solely for the bulk storage of malt beverages.

Their advantages gradually led to the adoption by other industries, particularly chemical and food. All during this time, The Pfaudler Co., with factories at Rochester, N. Y.; Elyria, Ohio; Leven, Fife, Scotland: and Schwetzingen, Baden, Germany, has been the world's largest manufacturer of glass lined steel processing equipment.

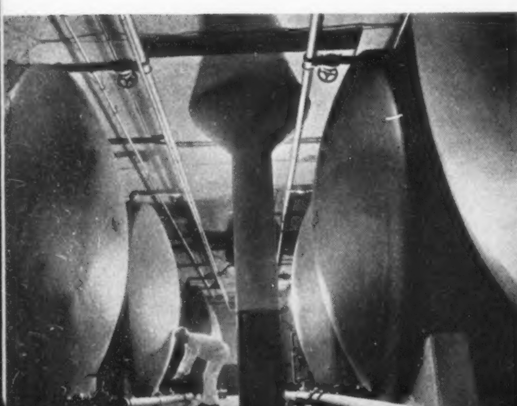
Enameling an Art

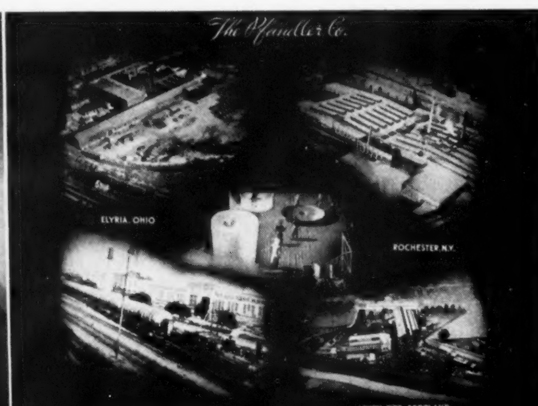
Enameling is an art as old as civilization itself. Yet, its commercial application is of comparatively recent origin. The terms "glass lined" and "glass enamel lined" are used interchangeably and refer to complex borosilicates which are fused to steel at temperatures averaging about 1800° F. The predominant raw materials are silica and borax. These glass enamels are highly resistant towards all acids (excepting hydrofluoric) regardless of temperature or concentration but must be used with caution against caustic alkalies.

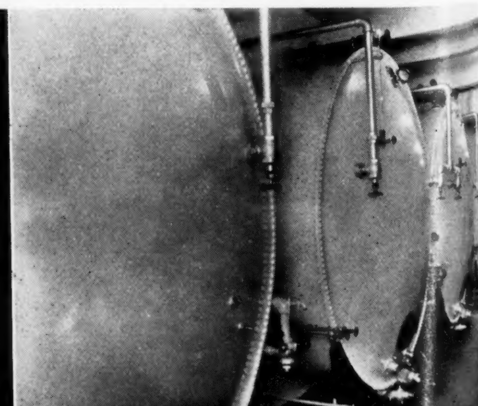
The application of the enamel to steel involves first the smelting of the borosilicates followed by grinding to an extremely fine frit. Parenthetically, it is not difficult to compound a glass enamel solely from the standpoint of high resistance to acids, but years of research underlie the development of enamels which will adhere and give perfect coverage over a relatively large area of steel. Adding to this the development of welding technique and furnace operation, glass enameling may well be classified as an art rather than a cut-and-dried factory operation.

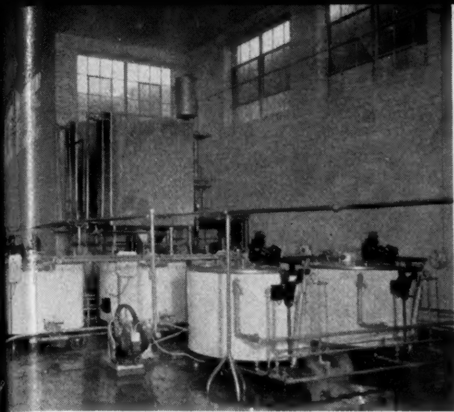
From its original use to the various applications for glass lined equipment today, there is little connection. But the evolution has been continuous. Research has brought its reward in an orderly fashion which has followed two distinct trends. First, the successful man-

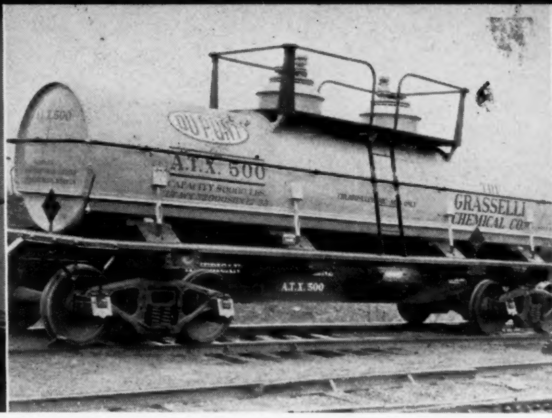
Left, a typical installation of large glass lined storage equipment for mouth wash at the Pepsodent Company, Chicago, Illinois. Center, present manufacturing facilities of The Pfaudler Co. Right, in practically all of the important breweries in the world, Pfaudler fermenting and storage tanks are standard equipment and this installation at Jacob Ruppert, Inc., New York City, is typical.

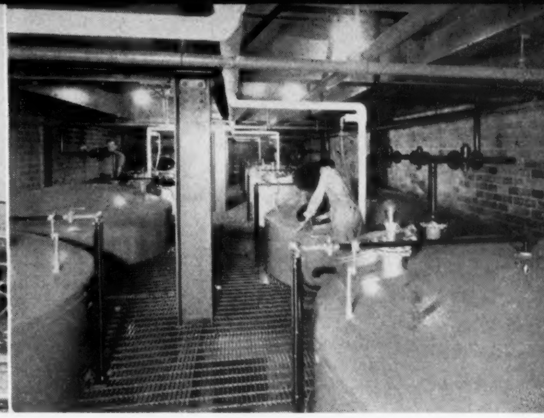












Left, Chicago's newest dairy, The Hunding Dairy Company, is equipped with Pfaudler storage and pasteurizing units. Shown is an automatic pasteurizing system which delivers 16,000 pounds of milk to fillers per hour. Center, one of the new uses for glass lined transportation cars is the shipment of chlorosulphonic acid by the Grasselli Chemical Co. Right, with the legalization of spirits, important distilleries have installed glass lined whiskey processing tanks and mixers on a large scale. Here is a typical installation at Hiram Walker & Sons, Peoria, Illinois.

ufacture of highly acid-resisting glass lined equipment. Second, economic trends and the enforcement by federal, state and local governments of standards of purity. Such laws govern everything from foods to highly corrosive chemicals. This forced greater care in processing and both have contributed to a wider application of Pfaudler glass lined equipment.

The Pure Food Act of 1906, for example, prescribed the standard of purity for various food products. This in turn involved some radical changes in handling methods. During the same period, business expanded from small, independent units to large mass production units. This stepped up the scale of manufacturing operations to the point where large sanitary handling equipment became necessary.

The greatest diversification of design and use is to be found in the chemical and allied industries and last year's sales of glass lined equipment reached an all-time high in the history of the company. It seems unnecessary to remind you of the factors which stimulated the processing industry in the United States. Suffice it to say that after the World War, synthetic chemistry grew by leaps and bounds. Glass lined steel equipment has benefited with each new chemical triumph.

Function of Equipment

The following general considerations have occasioned the extensive use of glass lined equipment by the processing industries:

Protection of the equipment against acid action and rapid depreciation.

Protection of the product against contamination and turbidity resulting from dissolved metallic salts.

Ease of cleaning and sterilization.

Improved yield by eliminating side reactions that are catalyzed by metal.

The elimination of off-flavor and color, particularly of foodstuffs, sometimes acquired during processing stages.

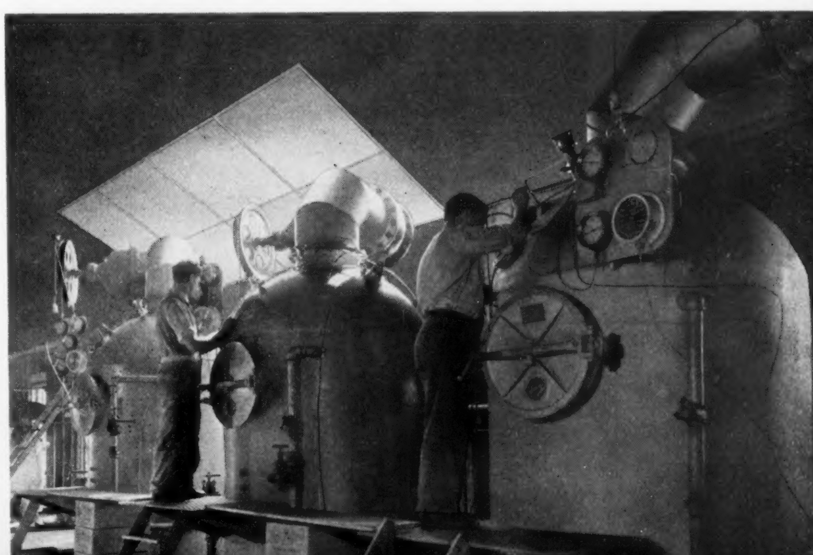
From the standpoint of design, glass lined equipment in standard types may be differentiated as open and closed, vertical and horizontal, and with and without jackets for heating and cooling. These may be equipped with suitable agitators for various mixing problems so that an extremely wide variety of operating conditions can be met.

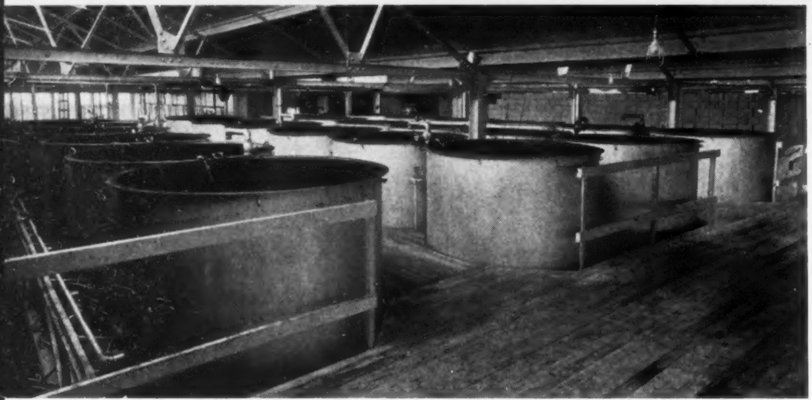
Jacketed types are required for most manufacturing processes within the chemical industry to permit heating by means of steam or circulated hot oil or cooling with brine or water. While jacket stay bolts are not possible in enameled tanks, pressures up to 75 and 100 pounds per square inch are obtainable from welded on steel jackets through which are carried flanged glass lined outlet connections and suitable stuffing boxes. Above the temperature range obtainable with steam, oil can be used safely to 600° F. Since Pfaudler glass enamel is thoroughly resistant to the halogen acids, many reactions are possible that could not otherwise be handled outside the laboratory. This applies particularly to sulfuric and the halogen acids.

For the production of pharmaceuticals and biological products, Pfaudler glass lined equipment has been used for years in maintaining absolute purity. Insulin has been made in Pfaudler glass lined equipment since its discovery and likewise, liver extracts. Both offer perfect examples of the degree of safety manufacturers of such products employ to avoid contamination.

The majority of process units for reactions, distillation, digestion, etc., is of the closed jacketed type, usually with enameled steel agitators. These are avail-

Wherever the concentration of vegetable products such as tomato paste and also fruit products such as strawberries, pineapples, raspberries, etc., is involved, glass lined vacuum pans are the rule. Below are three Pfaudler tomato paste pans.





Large installation of glass lined bean soakers at the Morgan Packing Company, Austin, Indiana.

able in standard designs and for acid conditions of maximum severity. Open jacketed evaporators in hemispherical shapes are extensively used for purposes such as the preparation of C.P. chemicals and reagents.

Glass lined pipe and fittings are available in diameters ranging from 1½" upward; also condensers, agitators, etc. All inlets and outlets are flanged and welded on, the enamel being carried over the face of the flange. This permits the assembly of completely glass lined systems which expose only Pfaudler glass to the action of the product.

Laboratory units are obtainable in sizes down to two gallons equipped with jackets and agitators; high-pressure autoclaves with renewable liners are also available.

Heavy Duty Service Records

Provided suitable care is exercised, glass lined equipment will give long service under highly corrosive conditions. Jacketed kettles used in the refining of rare metals, for example, have been in service nine years against hot, full strength aqua regia; others, with strong hydrochloric acid at 400° F. for the preparation of dye intermediates.

In another case, a large installation satisfactorily resists wet bromine and chlorine together with concentrated bromide solutions at elevated temperatures. Other examples demonstrate satisfactory resistance over a period of years to hydrobromic acid, iodine compounds, mixtures of alcohol and hydrochloric acid, etc.

With the introduction of plastics, synthetic resins, cellulose products and rubber accelerators, there has been a new demand for glass lined steel. Numerous industries specify glass lined equipment for mixing, cooking, pasteurization and storage purposes.

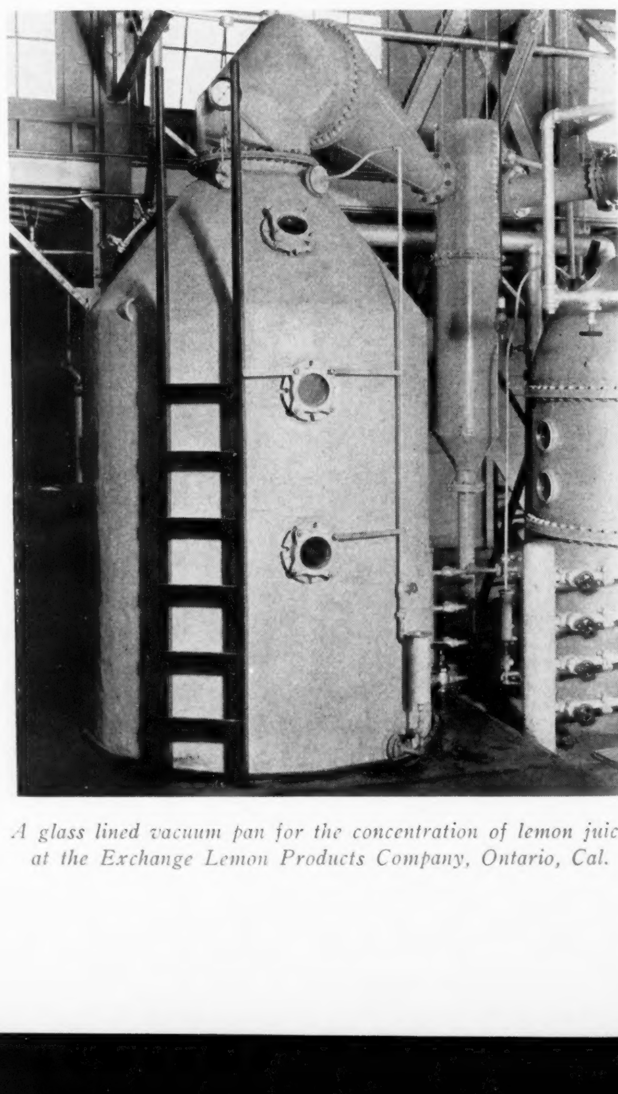
To the dairy industry, Pfaudler has contributed much that has made the industry what it is today. It was the glass lined tank car and truck tank which made the hauling of bulk milk practical. In the dairy plant itself, milk is temporarily held in huge glass lined tanks while awaiting pasteurization. In the metropolitan centers, dairies are equipped with Pfaudler automatic pasteurizing systems which automatically handle from 3000 to 30,000 pounds of milk per hour. In the smaller plants individual glass lined batch pasteurizers are used by the thousands.

Some of the nation's most famous soups, preserves, canned vegetables and fruits, extracts, mayonnaise, beers, whiskeys and the like, are prepared wholly or in part in glass lined equipment. Such equipment as glass lined vacuum pans, pressure-vacuum percolators, tomato cookers, etc., have reduced cost of operation. In each case, glass is used to maintain cleaner operating conditions, at the same time offering a surface which will not react with food acids to the detriment of color or flavor.

Glass lined steel tank cars for the transportation of various liquids constitute an interesting development of the past few years. While designed primarily for fluid milk, and several hundred 6000 and 8000 gallon cars are now in daily service for this service, their use is broadening to other fields such as the hauling of grape juice, wine, tomato pulp, candy filler, mineral waters, chlorosulphonic acid, laundry bleach, etc.

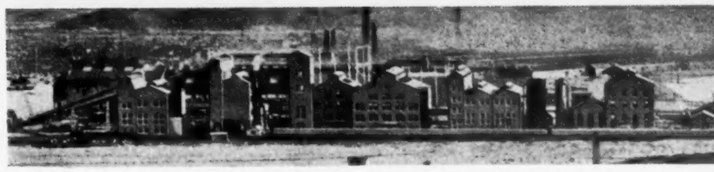
There is much that could be written about glass lined steel as a material of construction. Without due regard to its function in the field, however, it would be of little benefit. Uppermost in the minds of designing engineers is the necessity of making such equipment pay its way. Hence Pfaudler has had two aspects to consider and it has not been an easy road to travel.

The company now maintains four manufacturing plants, two in the United States—Rochester, N. Y. (head office) and Elyria, Ohio; one in Great Britain at Leven, Fife, Scotland, and one in Germany at Schwetzingen, Baden. Research and engineering staffs are stationed at each plant and their combined efforts have done much to increase the practical application of glass lined equipment in many industries, typical illustrations of which are shown on these pages.



A glass lined vacuum pan for the concentration of lemon juice at the Exchange Lemon Products Company, Ontario, Cal.

Chemical Plant Design and Construction



Complete synthetic ammonia plant erected for a foreign client.

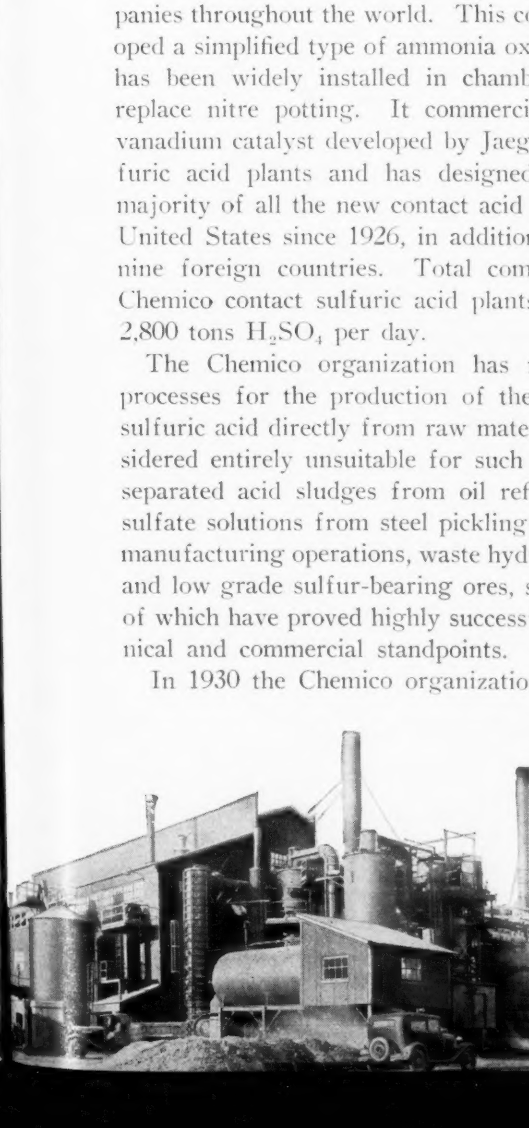
An institution with many outstanding achievements in the heavy chemical industry

THE Chemical Construction Corporation was formed in 1914, as the Chemical Construction Company of Charlotte, North Carolina, by a group of engineers whose leaders even then had nation-wide reputations as designers of acid and fertilizer plants. Among its early activities were the introduction of acid-proof masonry construction for sulfuric and nitric acid towers and tanks, invention of the masonry direct-fired Chemico sulfuric acid concentrator widely used in war-time plants in the United States, Canada and Great Britain, and the erection, for the United States Government, of the large nitric acid plants at Muscle Shoals and the other Government nitrate plants. Immediately following the war period, the principal work of the Chemico organization was the erection of numerous superphosphate and fertilizer plants and sulfuric acid chamber plants.

To meet the growing need of acid recovery systems for oil refineries, the two-stage submerged pipe type of sulfuric acid concentrator was invented by the company. This, in its present form as the Chemico drum-type concentrator, is recognized as the standard heavy duty acid concentrator, by the leading chemical and oil companies throughout the world. This company also developed a simplified type of ammonia oxidation unit which has been widely installed in chamber acid plants to replace nitre potting. It commercialized the use of vanadium catalyst developed by Jaeger for contact sulfuric acid plants and has designed and erected the majority of all the new contact acid plants built in the United States since 1926, in addition to installation in nine foreign countries. Total combined capacity of Chemico contact sulfuric acid plants installed exceeds 2,800 tons H_2SO_4 per day.

The Chemico organization has recently developed processes for the production of the highest grade of sulfuric acid directly from raw materials formerly considered entirely unsuitable for such use, including unseparated acid sludges from oil refineries, waste iron sulfate solutions from steel pickling mills and pigment manufacturing operations, waste hydrogen sulfide gases, and low grade sulfur-bearing ores, several installations of which have proved highly successful from both technical and commercial standpoints.

In 1930 the Chemico organization became a wholly owned subsidiary of the American Cyanamid Company and has since been free to draw on the technical experience and staff of this leading American chemical manufacturing company. In 1934 the Chemico organization was further augmented by the absorption of Chemical Engineering Corporation (another subsidiary of American Cyanamid Company), controlling the Nitrogen Engineering Corporation Process for the manufacture of synthetic ammonia and methanol, with the entire technical staff responsible for the development of these processes. Over twenty N. E. C. synthetic ammonia and methanol plants have been installed in twelve different countries and this process enjoys world-wide favor.



Chemico plant for conversion of ferrous sulfate to sulfuric acid. One of two erected for the same client.

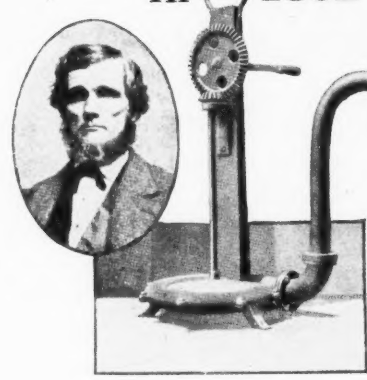
The present technical organization of the Chemical Construction Corporation includes engineers of international reputation in their respective fields of design and construction, a drafting room staff capable of preparing the plans for the largest and most complicated projects in a minimum of time, and a thoroughly equipped experimental laboratory where new processes and products are investigated on a semi-commercial scale before being offered to clients. The purchasing power of the corporation is such as to enable it to give its clients the best equipment of all types from the most economical sources. The company's construction supervisors are familiar with labor conditions in all the leading industrial countries. While the Chemico organization has specialized primarily in the types of plants referred to above and described in its published literature, the qualifications of its engineers and the information available from its associated companies are so complete that the Chemical Construction Corporation is prepared to undertake all types of engineering work for the heavy chemical industry, including projects for complete plants with all accessory facilities such as power plants, machine shops, docks, etc. Its contracts usually provide for the payment of a fixed sum for a complete project covering the design, installation and initial operation of some chemical process, but other forms of contracts, including those based on engineering fees, are available to meet special requirements. The performance of each Chemico plant is definitely guaranteed and clients' operators are trained in handling the plants before acceptance of work is requested.

Chemical Construction Corporation specializes in plants for production and recovery of sulfuric, hydrochloric, nitric and phosphoric acids, nitrates, phosphates, superphosphates, sulfates, synthetic ammonia and methanol, fertilizers, chemical salts, and all major products of the heavy chemical industry.

Making the Centrifugal Pump What It Is Today

An achievement for which the credit belongs to Morris Machine Works

In 1862



FEW people know who invented the centrifugal pump or how it became a reality. Generally an invention comes about because of an unsolved problem and as a result of research and effort to find the most practical solution. This was not the case with the centrifugal pump, as the need of such a machine, and a realization of what it might be able to accomplish, were wholly unknown.

John Boley, a maker of cradles for cutting wheat, was at work in his shop in Baldwinsville, New York, one day in 1862, and while watching his forge, his mind turned to the crude rotary blower or fan which supplied its air. "If that thing will pump air, it will pump water," he thought. His first model, shown above, confirmed his logic, and gave to the world the first practical commercial centrifugal pump. This pump was of the vertical type with gear and handle arranged similar to that used on egg beaters, and quite probably the idea for the gearing came out of Mrs. Boley's kitchen. The first demonstration of this pump consisted in placing it in a bucket of water and turning the handle, which operation emptied the bucket.

Due to the fact that the casing resembled that of a blower used on forges, Boley was able to patent only the wing or impeller. The actual development of the pump as a commercially desirable device covered a number of years of experimentation by George W. Heald and L. D. Sisco, who obtained patents in 1865, 1870 and 1875. At the latter date pumps made under the patents of Boley, Heald and Sisco, and made by the firm of Heald & Sisco, later Heald & Morris, were in more or less general use by chemists, paper makers, tanners, dredging contractors, etc. The great majority of installations were for lowhead work, and only in 1877 was there a well developed demand for pumps capable of delivering at a higher head or pressure.

Four-inch Morris Slurry Pump for handling 30% to 60% acid slurry and delivering at a variable capacity of from 50 to 600 gal. per min. against maximum total head of 56 ft. when operating at 900 r.p.m.

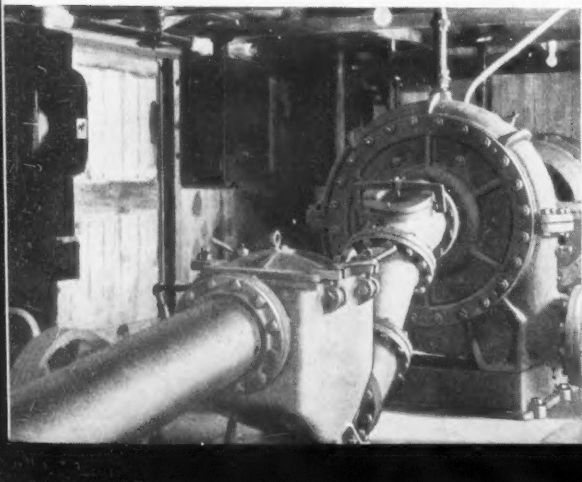
Old bulletins mention such uses as handling paper pulp, tannery sludge, chemicals, etc., and some of these bulletins refer to the pumps as "non-clogging," a type which is erroneously regarded as a recent innovation. That the basic design of these pumps was good is proven by the fact that the Morris Machine Works, which succeeded Heald & Morris, is from time to time called upon to furnish repair parts for pumps which have been in operation for between 40 and 50 years.

After the introduction of the multi-stage pump in 1877, there followed in rapid succession the double-suction pump, and the various other types of centrifugal pumps that are in use today. Practically all the new developments have come not only from better understanding of the theories of Boley, Heald, Sisco and Morris, but also from the experience with pumps designed by these men.

The early development of the centrifugal pump under the supervision of the direct predecessors of the Morris Machine Works, the later design refinements made by this company, and the 71-year reputation of countless installations for superior efficiency and long useful life, make Morris Pumps the logical choice for any chemical pumping project.

The present Morris plant at Baldwinsville, N. Y., has up-to-the-minute equipment and every facility for quantity and quality production.

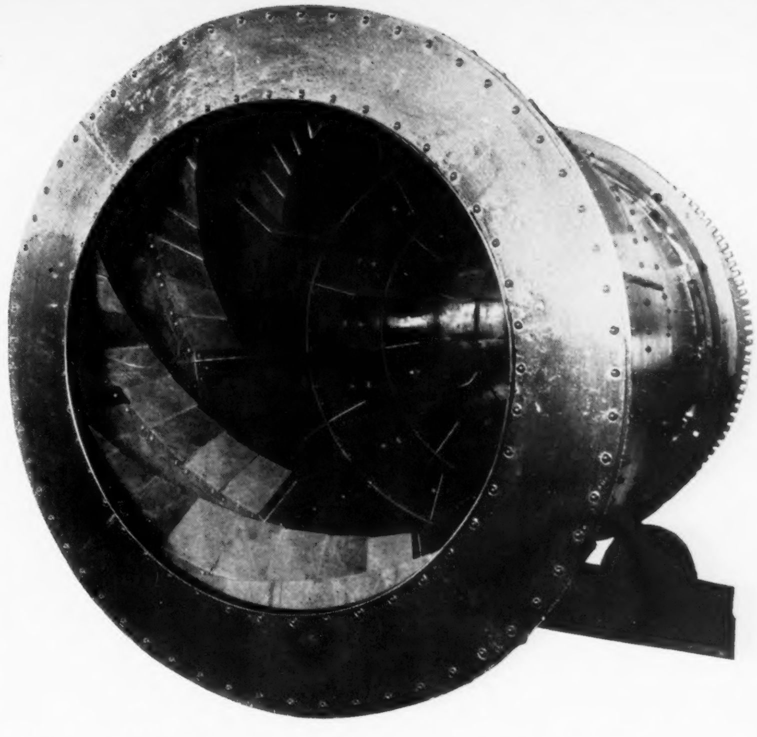
With countless records upon which to base design under any conditions, and with the reputation of standing squarely back of everything it builds, the Morris Machine Works should be consulted on any pumping problem.



Morris Dredging Pump for continuous hard service in handling liquids containing large solids.

℞ NICKEL

to Safeguard Equipment and Product



Monel metal is the standard prescription for rotary driers and other equipment in the processing of salt.

WHAT nickel has to contribute to an industrial field which is noted for its highly corrosive substances and its high pressures and temperatures in the manufacture of pure products is not only corrosion resistance but also physical and mechanical properties which give the metal, particularly in alloy form, definite structure importance. To a considerable extent the participation of nickel is through monel metal, the nickel-copper alloy which now is produced with the strength of alloy steel. Of growing importance are the stainless steels and the alloy steels containing from 2 to 5 per cent. of nickel, and the nickel cast irons are also being used in an ever-increasing variety of applications in the construction of chemical equipment. In addition nickel-clad steel and Inconel, the nickel-chromium alloy developed initially for pasteurization equipment in dairies, may be considered as being primarily materials for the chemical industries.

In many processes corrosion is a double-edged sword, both attacking the metal of which the equipment is made and contaminating the material in process of manufacture. One example is the rayon industry in which metal-free caustic soda is an essential factor if purity is to be assured in the product; yet this corrosive agent is used in such large quantities that equipment of a strength usually associated with steel is required. Pure nickel offers the freedom from contamination, the corrosion resistance and the needed strength, and it is so used. The development of nickel-clad steel now offers these same two properties at a reduced cost compared with all-nickel construction, and it is therefore being widely adopted for caustic evaporators as well as for tank cars and storage tanks. Tubing for evaporators and pumps on forced circulation units now use nickel as standard material.

Other examples may be found in the food processing industries where both color and taste may be affected by metal contamination and where bright, unpitted surfaces which are readily cleaned are essential to the purity of the products. Here monel metal and pure nickel prove their usefulness in a variety of applications.

As previously indicated, the alloy, Inconel, was developed primarily because of the susceptibility of milk to metallic contamination at various of the temperatures involved in the pasteurizing process. Now this alloy is being used in equipment for the distillation of gin and the processing of wines, because, there also, clarity of color and purity of flavor measure the excellence of the products. In addition, certain of the nickel cast irons, particularly Ni-Resist, are being introduced

Pure nickel provides rugged equipment for the ammonia oxidation process. Some nickel tees cast from this metal for a single installation.

for heavy castings in food handling equipment which is subjected to the splashing of acids or to contact with other corrosive agents.

Rather than attempt to cover in generalities the whole field of the chemical industries, various processes will be sampled to determine what applications of nickel and its alloys are included in the construction of the equipment and why they came to be used.

A single hosiery company has a daily output of thousands of dozens of stockings in one or another of 300 shades of color, yet uses only eighteen dyeing machines. By substituting monel metal for wooden equipment which required prolonged boiling out between color changes, the switch from one shade to another is now made with minimum loss in production time and idle machinery.

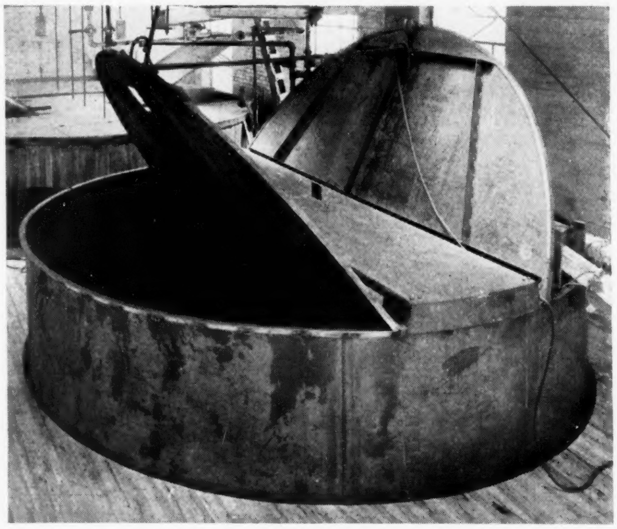
There has been a steady increase in the use of nickel in the viscose rayon industry which demands freedom from metallic contamination. Here nickel is used for vacuum crystallizers in the recovery and concentration of chemicals from coagulation bath liquor.

With the growing use of non-combustible synthetic solvents for dry cleaning, the high initial cost of these products has stimulated installation of recovery apparatus. Owing to the corrosive nature of the solvents, leading manufacturers of dry cleaning equipment are now specifying monel metal as standard for reclamation systems handling carbon tetrachloride and other chlorinated solvents, as well as for filter elements in pressure filters handling such common petroleum solvents as gasoline, benzine and naphtha. The trend is toward the use of this nickel-copper alloy not only for the large installations in dry-cleaning plants and laundries but also for the units sold or rented to the smaller shops.

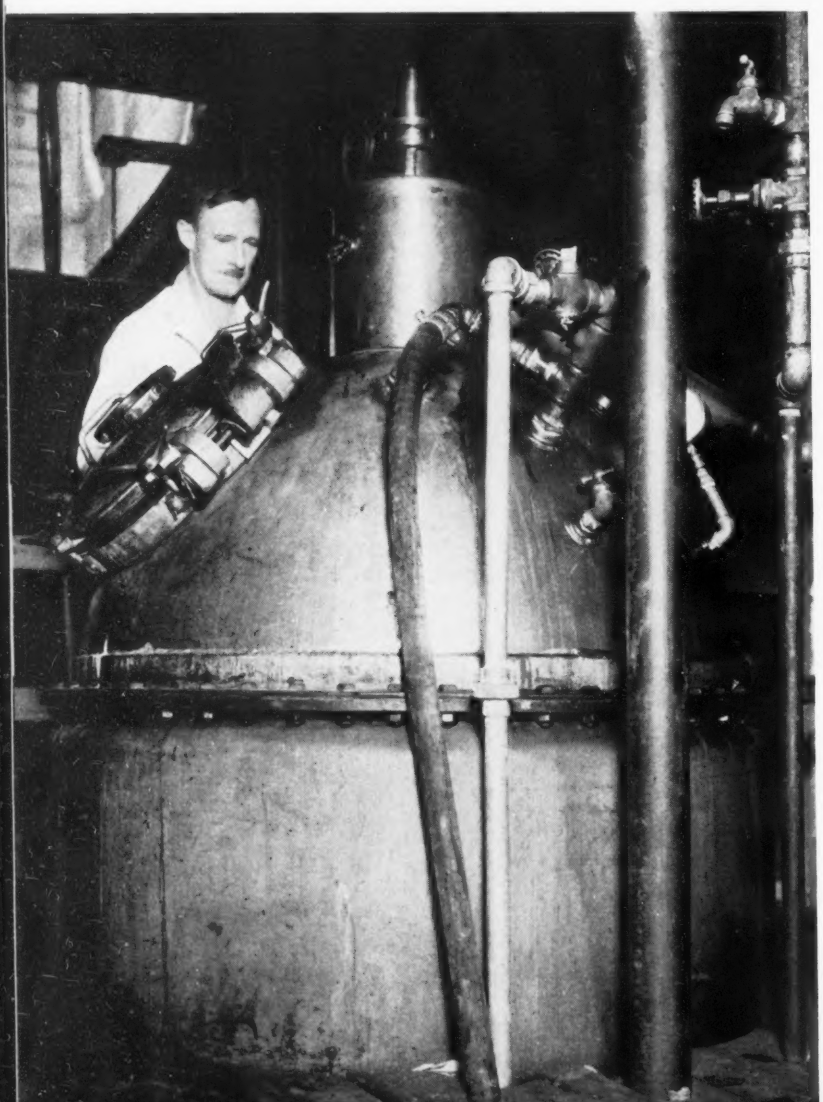
Manufacturers of sulfonated oils, which are used in the textile and leather industries, have taken advantage of monel metal's corrosion resistance to sulfuric acid in constructing sulfonating tanks for the treatment of castor oil, neatsfoot oil, etc. Improved quality of product, longer life of equipment and greater economy in operation have resulted.

A new use for monel metal is in the equipment for tanning fine glove leathers. A preliminary operation is the processing of the skins with sulfuric brine solution in large tumbling drums. Because of the corrosive action of the solution, the drums have usually been made of wood which has the two disadvantages of being hard to clean and of becoming roughened, thus scratching and tearing the skins during the tumbling operation. By lining these drums with monel metal the tanners have provided a permanently smooth surface which cannot damage the skins. Also, because such a metal surface is non-absorbent and easy to clean thoroughly, one drum can now be used for the pickling and dyeing processes as well, thus reducing the amount of equipment required.

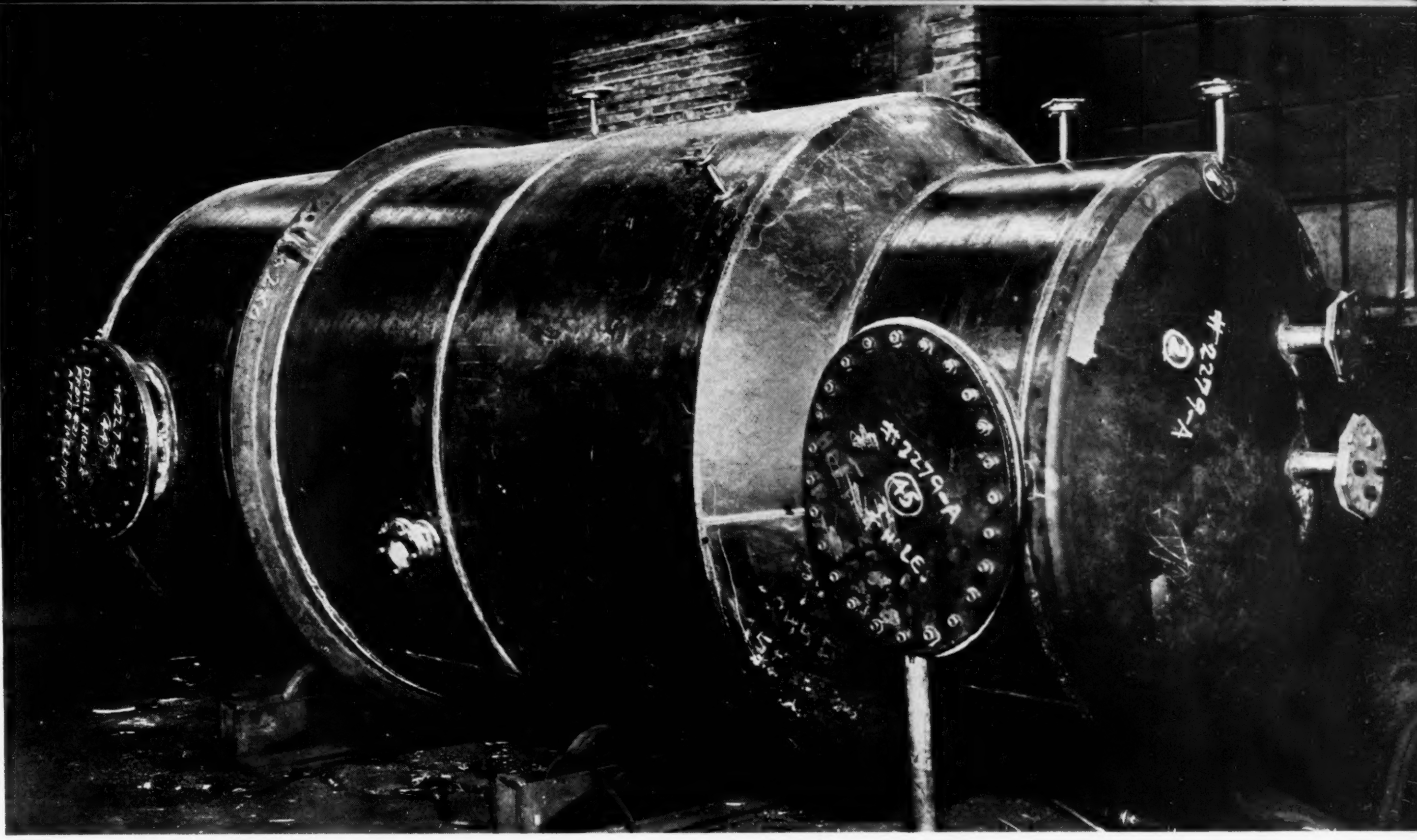
Corrosion is such a problem in salt manufacturing plants that even the shovels used are made of monel metal. A recent tabulation showed that more than fifty different tools and machine parts made of this



The product must be pure when manufactured in a kettle of nickel-clad steel. A soap boiling kettle.



This jacketed nickel kettle was constructed by the George Keller Copper Works for use in the manufacture of cast phenolic resin.



material are used in salt works, while nickel-clad steel and nickel cast irons have also been adopted for special applications.

Inconel, the chromium-nickel alloy, is the material from which Alloy Fabricators, Inc., built this bubble still for use in the preparation of fatty acids.

An application of monel metal, which demonstrates several of its most striking properties, is in the construction of the drums on which salt ice is manufactured. This mixture of salt and ice is frozen on the drum which discharges the product by distortion of the shell on which the ice ribbon is formed. The process was really made possible by monel metal because of its high resistance to failure by fatigue when in contact with such corrosive substances as calcium chloride and sodium chloride, and because of its retention of ductility and toughness at the low temperature involved in the freezing operation.

Ni-Resist, the special nickel alloy cast iron, has begun to contribute substantially to the progress in the manufacture of food products. Many of these corrode gray cast iron, and ultimately the task of removing residues from microscopically pitted surfaces becomes extremely difficult. Consequently, Ni-Resist is being employed for machine frames, canning equipment, meat choppers, dough mixers, conveyors, packaging equipment, and other utensils and machine parts which come into contact with foods or beverages or are splashed by these products, and even for equipment which is merely exposed to the humid atmosphere of food processing establishments.

Fruit growers who spray their trees with poisonous insecticides have created a problem for food processors. To make the products safe for human consumption and to comply with the United States Food & Drug Act, it is necessary to remove every trace of poison. As the weak solutions of hydrochloric acid used for this purpose tend to corrode equipment, it is made of monel metal.

After more than a year's use, Inconel has proven its superiority in the construction of screens for drying gelatin used in the food and adhesive industries. This alloy offers complete freedom from contamination and discoloration of the product and resists the service of beating off the dried gelatin.

The exacting standards of whiteness in fatty acids and of clarity of color in the quality soaps, fancy cos-

The chemistry of food acids has brought canners and packers to nickel and its alloys to safeguard equipment and product. A monel metal centrifuge for preparation of jelly stock.

metics and pharmaceuticals made from a fatty acid base, have made the manufacturers increasingly dependent on equipment which is resistant to corrosion and which therefore will not contaminate these products. To this

In the tanning of fine leathers monel metal drum linings protect the skins during the tumbling operation.

end monel metal is being introduced for piping, valves, bubble tray supports and bubble caps because of its resistance to corrosion and because of its strength at high temperatures; Inconel is being used for continuous heaters and vacuum bubble towers, and nickel-clad steel is an increasingly popular material for soap crutchers, mixers and heating kettles.

The use of Inconel for photographic hypo-fixing tanks is increasing in the moving picture industry.

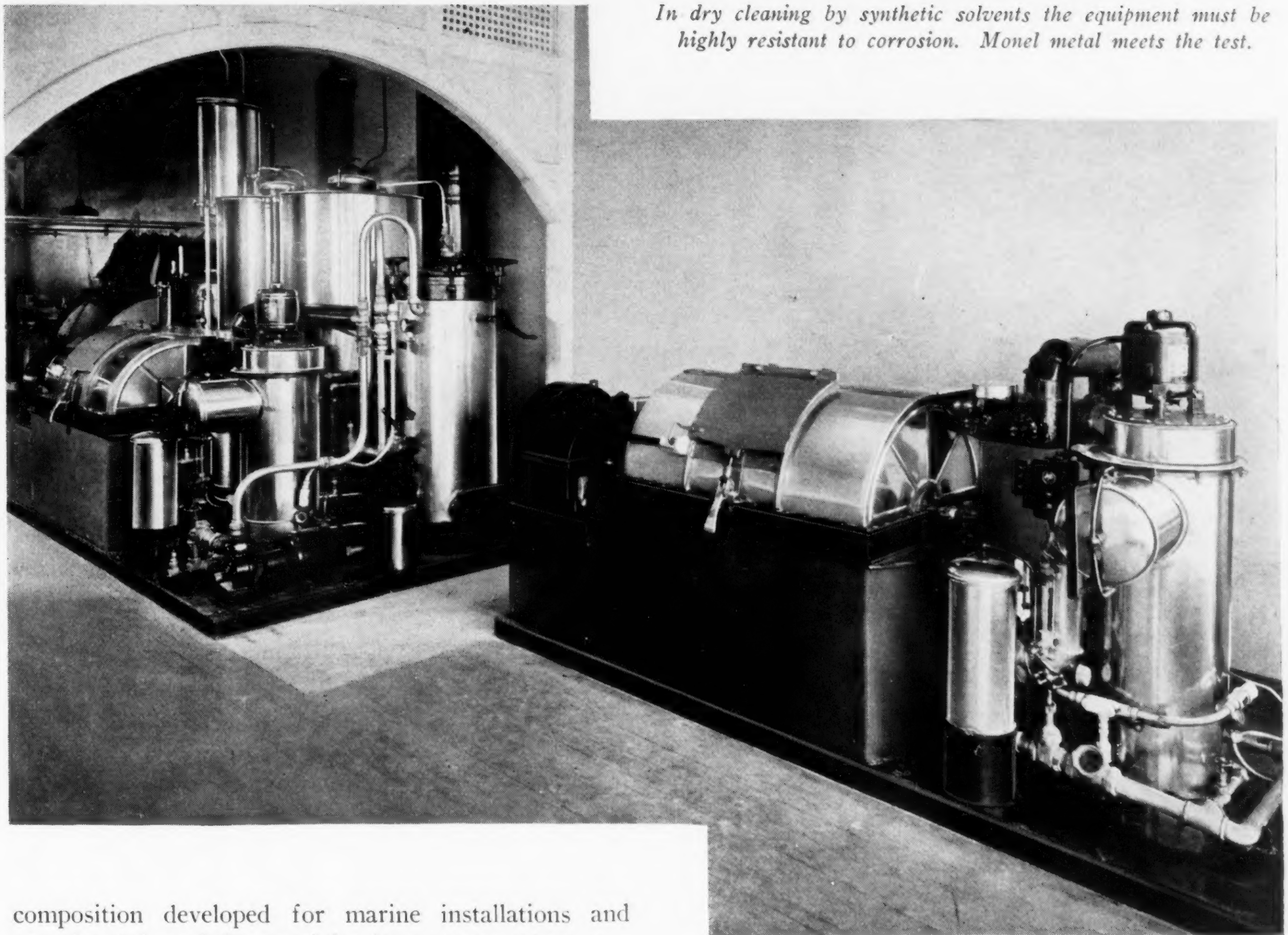
The current practice of de-waxing lubricating oils at sub-zero temperatures has been made possible by the development of structural materials which will retain their impact value even when the temperature drops out of the bottom of the thermometer. In normal operations the addition of from 2 to 5 per cent. of nickel to steel provides a satisfactory material with good resistance to shock at temperatures as low as 75° below zero F. Monel metal is used for screens and wax sweater pans.

A steel containing 20 per cent. of nickel, 8 of chromium and one per cent. of silicon has been adopted by several refineries because of its high temperature properties and corrosion resistance. It has given excellent results in wrought and cast forms for such purposes as cracking still tubes, valves, pumps and pump rods, and still plugs. For certain special cases where conditions call for resistance to severe temperatures, tubes of even more highly alloyed composition are used.

The use of pure nickel for paraffin chlorinators, where the equipment must resist the action of petroleum hydrocarbons and moist chlorine gas, is increasing. Nickel has also been shown to be resistant to concentrated ammonium chloride.

There probably are no more vexatious problems in oil refining than those presented by tubular exchangers, condensers and coolers. Some exchangers have tubes of 18/8 stainless steel where the temperatures are relatively high, whereas cupro-nickel tubes of the 70/30

Modern processes require modern equipment. This tank car is built of nickel-clad steel to provide bulk transportation without contamination of the phenol. Similar cars are used for caustic soda.



In dry cleaning by synthetic solvents the equipment must be highly resistant to corrosion. Monel metal meets the test.

composition developed for marine installations and monel metal are being used for lower temperature condensers and coolers, especially where brackish water is the cooling agent at seaboard refineries.

Corrosion problems in the petroleum field vary widely with the types of crude oil being treated. Ni-Resist pumps handling reflux at one plant give four months of service compared to one month from gray cast iron. At another plant a Ni-Resist pump was apparently still in good shape after three years of service.

Mud is used as a cleansing agent for rotary drilling equipment in the oil fields. As it is an expensive mud prepared from special clay and other materials, it is cleaned and re-used. An important step in the cleaning process is that of passing the mud over a finely meshed screen vibrating at high frequency to remove the debris and to drive out the gases picked up in the drill holes. Both mud and debris are abrasive, and the gases are corrosive. Monel metal has been selected as the material for the screens.

The use of nickel and of nickel-clad steel in the production of synthetic phenolic resins has increased steadily because of the demand for an equipment material which will not affect the delicate colors of the product. Nickel is useful for the equipment in which the reaction takes place and nickel-clad steel for tanks and tank cars in which the phenol is stored and transported.

Pure nickel is used for piping, cast fittings and connections, filter bodies, screens and catalyst holders in the ammonia oxidation process. This is because it resists the action of hot ammonia gas and air prior to the conversion into oxides of nitrogen and prevents cracking of the ammonia. Nickel also has the strength to meet high pressure requirements of the process.

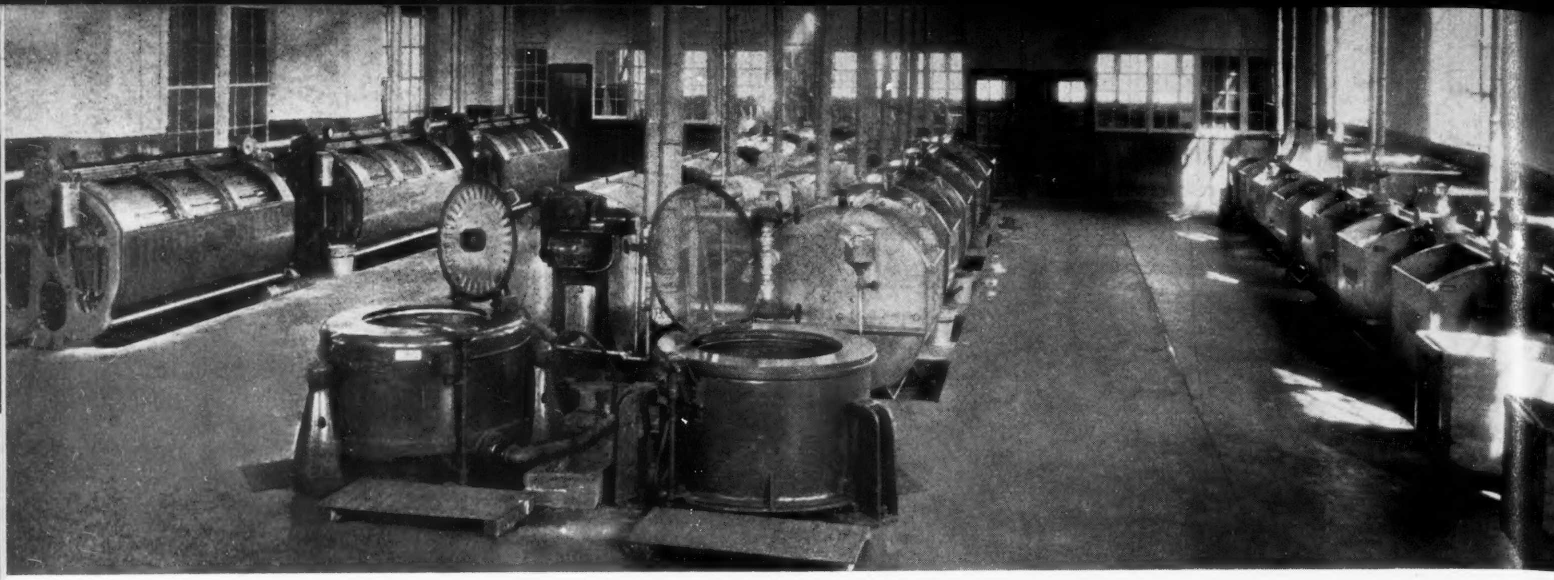
In the new plants built here and abroad for the fixation of atmospheric nitrogen, stainless steels of the 18/8 variety have been widely used for equipment. This process is a high pressure catalytic method for producing ammonia followed by oxidation and the production of nitric acid. It is no exaggeration to say that the rapid development of the process has been co-incident with the development of the stainless steels.

The sulfite pulp process for the manufacture of paper has been improved by the introduction of indirect heat and the circulation of the cooking liquors. These operations depend upon the ability of chromium nickel iron alloys to withstand the corrosive attack of the liquors at high temperatures.

Numerous tests have shown monel metal to be well suited for coils in zinc chloride evaporation. It has been successfully used for this purpose for more than a year.

After its final polishing in the factory, plate glass is washed with dilute hydrochloric acid to remove the polishing rouge from the surface. This is one of the most troublesome acids to handle, and frequent shutdowns for repairs to the washing equipment were the rule until monel metal was selected for its construction.

An interesting application for nickel is in frangible



The quicker a dye vat can be cleaned the sooner it can be used for another color. Here is an installation of monel metal equipment which can handle hosiery production in three hundred different shades.

discs used in place of safety valves on pressure vessels. This simple safety device has no working parts and is easily and inexpensively replaced as compared with safety valves which sometimes are difficult to keep in good working order on chemical vessels. Because of the high uniformity of its strength properties, nickel is preferred for this purpose to other pure metals and alloys that are commercially available.

Ni-Resist is appearing more and more in the equipment of many of the chemical process industries including oil, coke, gas, salt, soap, paper, edible oils, fatty acids and textiles. Extremely heavy castings are regularly employed for large pumps, still parts, filters and condensers. Ni-Resist pipe produced by both the sand and centrifugal processes is now available on a commercial basis, thus opening up a market for its use in equipment for handling corrosive industrial waste and by-product liquors.

Development of "K" Monel has made available to equipment designers a metal which offers high resistance to the destructive combination of abrasion and corrosion. Produced in four different conditions or grades, it shows an ultimate tensile strength up to 160,000 pounds per square inch and a Brinell hardness up to 320 when cold worked and thermally hardened. Among its applications are those for doctor blades, high-pressure steam nozzles, pump rods and valves where operating conditions are particularly severe.

The Hastelloy group of alloys and Illium, all of which contain more than 50 per cent. of nickel, are finding applications in equipment which operates under the difficult conditions involved in handling of concentrated acids. Hastelloys A & C show excellent corrosion resistance to hot and cold hydrochloric acid of all concentrations, and Hastelloy C to wet chlorine gas, sulfurous and phosphoric acids. All three grades of the Hastelloys are recommended for corrosion resistance to sulfuric acid, both hot and cold, Hastelloy D being especially adapted to handling this acid in all concentrations at temperatures up to the boiling point.

To a large extent the chemical and process industries may be said to rest on heavy materials which must possess strength, toughness, wear resistance, heat resistance, machineability and other qualities. Cast irons alloyed with from .50 to 3.50 per cent. of nickel answer these requirements and are widely used for gears, cams, pump parts, compressors, valves, etc. Nickel steels, nickel bronzes and nickel brasses find similar uses in the supporting structure.

Safe and simple, these frangible discs of pure nickel protect pressure vessels from exploding. When they do burst they are easily replaced.

Sixty-three Years of Experience in the Manufacture of Equipment

The B. F. Gump Company Has Introduced In that Period a Number of Mixing and Packaging Innovations to the Chemical and Process Industries

ESTABLISHED in 1872 to serve primarily the elevator and flour milling plants of Chicago and the Middle West, the B. F. Gump Co. soon branched out into the field of general equipment and supplies for food processors and industrial plants requiring equipment for grinding, sifting, mixing, weighing and packing of dry powdered or granular materials.

Scope of Activities

The Company has enjoyed continuous operation for sixty-three years and at the present time serves principally chemical processing plants, flour and feed mills, wholesale grocers, and coffee roasters.

Engineering Activities

The Company maintains its own engineering department, where experimental work and designing of new equipment is carried on and where many of the country's largest and most successful continuous mixing plants have been designed.

W. M. Williams, President, has devoted the past twenty-eight years to the management of this concern, which has been guided to the position of successfully serving processing plants from coast to coast.

The present officers include:

William M. Williams...........President
Paul Naeher...............Vice-President
A. J. Hazle, Jr...........Vice-President
Maurice T. Williams..........Treasurer
Ralph E. Williams.............Secretary

Equipment for Process Industries

Some of the products manufactured and sold exclusively by the B. F. Gump Co. are numbered and illustrated on this page.

1—Draver "Wing-type" Percentage Feeders for feeding dry powdered or granular materials accurately and continuously.

2—Draver Master Drives for driving two or more Draver Feeders in a continuous mixing system.

3—Draver Continuous Mixing Systems assure accurately finished blends at low cost.

4—Draver Style "K" Chemical Feeder—feeds dry powdered or granular material accurately and continuously in small quantities ranging from ½ ounce to 3 pounds per minute.

5—Special units designed and constructed to meet individual plant requirements. This self-contained unit includes a feeder, roller mill granulator, magnetic separator, elevator, and sifter all mounted on one welded steel frame.

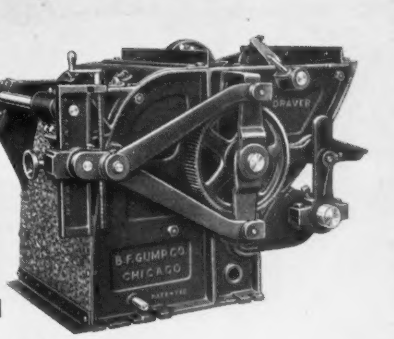
6—Edtbauer — Duplex Automatic Net Weighers, for packaging.

7—Vibrox Bag Packers for packing bags quickly and thoroughly.

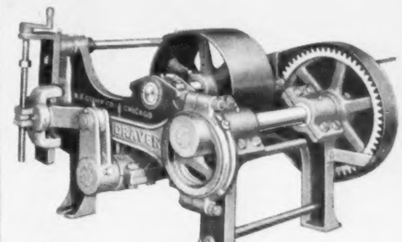
8—Vibrox Barrel Packers for packing drums or barrels ranging from 100 to 750 pounds. Vibrox Packers are made in five sizes for cartons, bags, boxes, etc., ranging from 5 to 750 pounds.

Modern Manufacturing Facilities

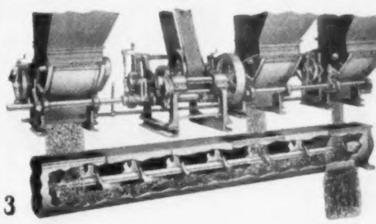
The office and manufacturing plant are located at 431-437 South Clinton Street, Chicago, Illinois, where the most modern and up-to-date equipment is to be found, including a complete roll grinding and corrugating department.

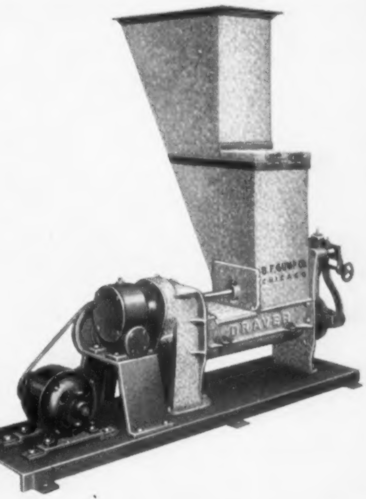


1

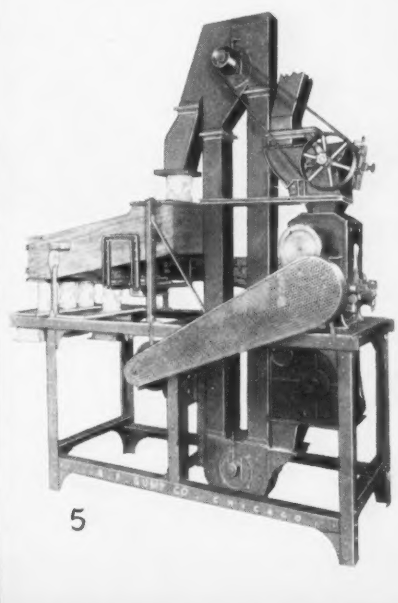


2

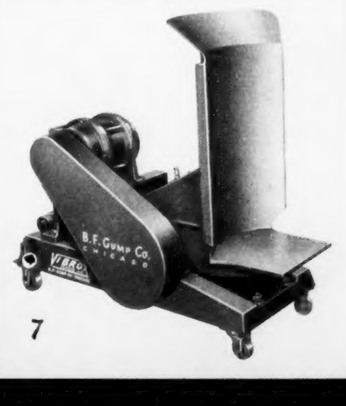

3



4

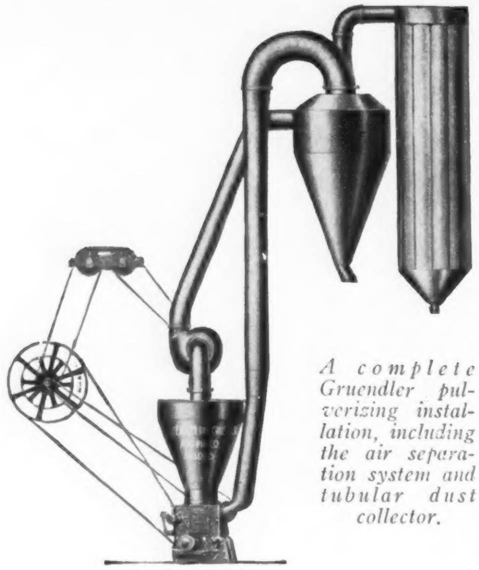

5

8



7


6



A complete Gruendler pulverizing installation, including the air separation system and tubular dust collector.

The Gruendler Swing Hammer Principle

Fifty Years Ago William Gruendler, Sr., Introduced a Revolutionary Method of Crushing to the Process Industries.

THE Gruendler Crusher and Pulverizer Co. has faithfully served the chemical and chemical process industries for half a century. For fifty years a group of engineers have devoted their entire lives to the perfection of crushing efficiency, presenting new features from time to time after exhaustive and conclusive tests, to enable the chemical manufacturer and others to overcome advancing labor costs, speed up production, and to improve end-products.

William Gruendler, Sr., established the Gruendler Machine Co. in 1885 to manufacture a crusher for meal on the now famous Gruendler swing hammer principle. The present name was adopted in 1901 when the company was incorporated. Within a short time the company branched out into the manufacture of crushers for the fertilizer industry and then into crushing equipment for the cottonseed meal and cake producers.

The crushing problems of other industries were then undertaken until by now the list of successful installations in various industries is far too long to mention in detail and alphabetically runs from "Allspice" to "Wood Paper Pulp." In each and every case Gruendler engineers approached the problem with due consideration for the individuality of the product, its physical and chemical properties, and the desired results. Gruendler engineers were adamant against the introduction of a general "crusher" that would be a "cure-all" for all crushing problems. Younger chemical engineers may not appreciate what a step forward this stand was at the time, or how profoundly it shaped the future course of approach to the design of crushing machinery, but older engineers, plant managers and superintendents well remember the "coffee grinder stage" and the headaches and heartaches and failures of that earlier era.

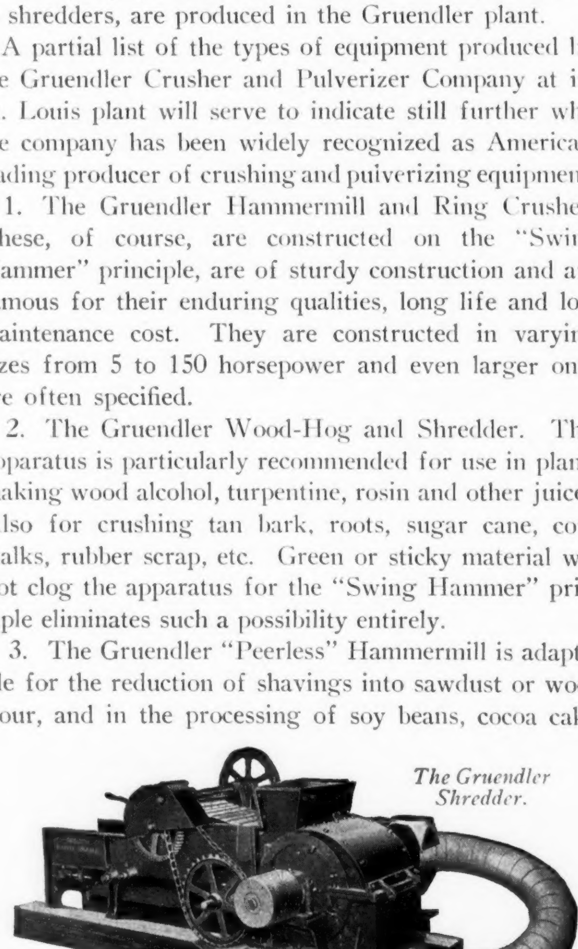
The Gruendler Crusher and Pulverizer Company does not offer to the manufacturer just a crusher—every Gruendler installation is designed to fit the particular requirements of the user, special emphasis being given to seeing that the crushing operation is fitted into the general manufacturing operation as an integral part and that the whole production arrangement functions smoothly, efficiently and economically. This service very often requires involved layouts. Very often it is advisable from an engineering standpoint to have crushing, drying and pulverizing operations closely combined or synchronized. It is in such instances that the services of Gruendler engineers are extremely helpful for the problem can be handled by them as a whole and the necessary equipment, crushers, dryers and pulverizers or shredders, are produced in the Gruendler plant.

A partial list of the types of equipment produced by the Gruendler Crusher and Pulverizer Company at its St. Louis plant will serve to indicate still further why the company has been widely recognized as America's leading producer of crushing and puiverizing equipment.

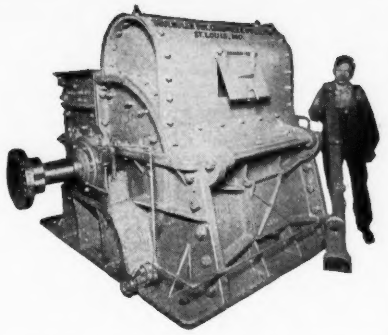
1. The Gruendler Hammermill and Ring Crusher. These, of course, are constructed on the "Swing Hammer" principle, are of sturdy construction and are famous for their enduring qualities, long life and low maintenance cost. They are constructed in varying sizes from 5 to 150 horsepower and even larger ones are often specified.

2. The Gruendler Wood-Hog and Shredder. This apparatus is particularly recommended for use in plants making wood alcohol, turpentine, rosin and other juices. Also for crushing tan bark, roots, sugar cane, corn stalks, rubber scrap, etc. Green or sticky material will not clog the apparatus for the "Swing Hammer" principle eliminates such a possibility entirely.

3. The Gruendler "Peerless" Hammermill is adaptable for the reduction of shavings into sawdust or wood flour, and in the processing of soy beans, cocoa cake,

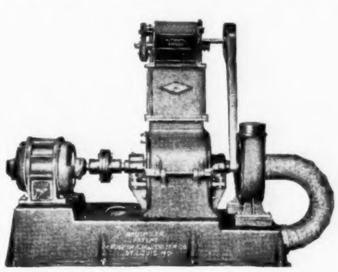


The Gruendler Shredder.



sugar, copra, cottonseed cake and other similar products. Where desirable a mixture of materials can be ground to any fineness in one operation.

4. The Gruendler Standard Whirl Beater is employed in large numbers for the reduction of heavy chemicals and fibrous materials. A modified form of this equipment known as the High Speed Special Whirl Beater, is recommended for color grinding. This mill may also be equipped with an air conveying system fan and cyclone collector and cloth tabular collector so that it may be readily used on intermediates and other delicate products which must be ground cool. On semi-soft colors—the materials may be ground to pass 100 or 120 mesh. On hard dyes the best which can be obtained is 75 per cent. to pass 80 and 100 mesh. Laboratory sizes are also available for testing and research departments.



Peerless Grinder specially adaptable for fine grinding. Above and below, other examples of grinding and pulverizing equipment.

Gruendler chemical grinders and pulverizers are equipped with dust-proof ball bearings to prevent friction and heating. Any fineness from 80 to 300 mesh may be obtained without stopping the machine by simply regulating the fan speed and air valves, thus eliminating loss of running time.

A vacuum, formed by the action of the separator and fan, lifts the product when it has reached the proper fineness. It is then fanned into the cyclone metal collector and separated from the air. All dust is removed from the surplus air, which then passes into a tubular collector and is discharged. Heavy flexible rollers, to be run at slow speed and regulated to the nature of the material can be supplied when necessary.

5. The Gruendler Rigid Hammer Crusher is designed for process industries to shred, crack and granulate various materials with the very least possible amount of fines, such as coal, gypsum, burnt lime, carcasses, etc.

6. The Gruendler Shredder is employed universally for processing grain stalks.

7. The Gruendler Portable Crusher, in the jaw or hammer types, can be furnished complete with screens, bins and elevator all mounted on heavy wheels.

8. The Gruendler Jaw Crusher, with a tensile strength of approximately 100,000 pounds, is designed for particularly heavy and difficult work, yet is economical in the consumption of power.

9. The Gruendler Double Roll Crusher is employed where a minimum amount of fineness is desired, such as in briquetting roofing materials, where the reduction of 2 inch to 30 mesh is satisfactory. The Single Roll Crusher is suitable for handling mine run coal, clay, gypsum, shale and other medium hard materials. The Ring-Roll Pulverizer is used where medium hard and hard materials have been previously reduced to one and one-half inches for the larger mills and one-half inch for the smaller types. It is ideally constructed for use on furnace slag, iron, ore, Tennessee lump rock, Florida pebble rock clinkers, limestone and other materials with similar physical properties.

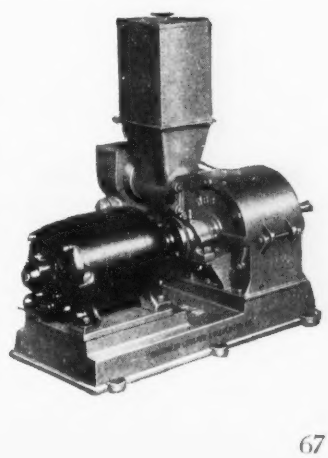
10. The Gruendler Impact Beater Mill, which works on the principle of combination beating and rolling of the material, is suggested when semi-hard materials are to be ground to a 200 mesh.

Shaker screens, ideal where a fineness of not more than 100 mesh is required, are another standard product of the Gruendler factory. They are regularly made in 4, 6, 8, 12 and 14 foot, and larger sizes to meet special requirements can be supplied on request. Their use is highly desirable in connection with the use of Ring Roll Mills.

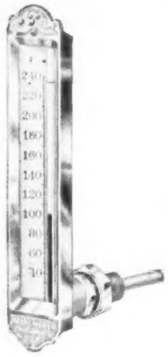
The Gruendler Crusher and Pulverizer Company also manufactures a complete line of open and enclosed types of elevators with many novel and exclusive engineering features. They are furnished with all steel casings or without, also with or without boot and head. The equipment is very accessible and is easily and quickly cleaned.

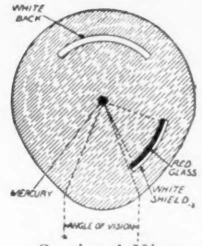
Because the problem of drying is, in many instances, intimately connected with the crushing and pulverizing operation, Gruendler engineers have developed a line of dryers regularly manufactured in 36, 48, 60 and 72 inch diameters. Oil, powdered coal or direct or indirect steam can be used. In special manufacturing operations where standard drying equipment cannot be utilized for one reason or another, Gruendler engineers are readily available for the design and erection of special units.

In every type of equipment manufactured by the Gruendler Company a very complete range of sizes and capacities is always available, but much of the company's contribution to the advancement of the chemical and process industries in the last few decades has been through the ability to render special services in design and installation where standard equipment is not satisfactory. Manufacturers in the chemical and process industries have found this wealth of broad and varied experience on the part of Gruendler engineers very valuable indeed. Worthwhile economies have been effected in all cases.



Thermometers





Sectional View of "Red-Reading Mercury."

"The Heart of the Chemical World"

THE first thermometer, as everyone knows, was made by Galileo in 1593. Since these first crude instruments for testing temperature, many improvements have been made. Mercury, however, was found to be the one and only medium to use for a precision thermometer. Throughout the ages, chemists have tried to color the liquid metal but without success. The mercury column was not always easy to read but it was the best that could be offered to the trade.

Thermometers were first made in Cincinnati in 1872 by Richard Penny Palmer, who traces his connection with the chemical industry back to the days when he worked for James Foster Jr. & Co. Associated with the firm was Henry Twitchell, Professor of Astronomy of the U. S. Observatory and Walter Alden, author of "Alden on the Eye." They specialized in a line of fine instruments of all kinds. While working for this firm, Mr. R. P. Palmer designed the Foster Automatic Oil Tester, which was adopted by the State of Ohio and other states and is still in use today. This instrument was used to test the flash point of oil by state inspectors. The firm of Hawkins and Palmer merged from the old Foster Company and continued until 1895 when Richard P. Palmer bought out the Hawkins interest. In 1905, his son, Charles Richard Palmer, became one of the firm and the company was known as R. P. Palmer & Co. Richard Palmer continued to make very fine instruments of all kinds and enjoyed a splendid reputation in and around Cincinnati. When he retired in 1916, his son devoted his time and energies to the manufacture of industrial thermometers only and in 1918 a corporation was formed, known as The Palmer Company.

In 1926 Bartlett Palmer, son of Charles, started with the firm and in 1932 was placed in charge of sales. Since the date of incorporation, the firm has grown to be one of national and international scope. There are selling representatives in twenty leading cities in the U. S. with a branch factory at Toronto—The Palmer Thermometer Company, Ltd.—and a representative in London—The Industrial Thermometer Company.

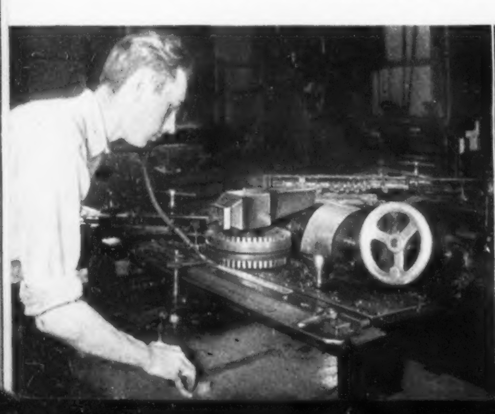
Constant experiments were made in our own Research Laboratory until in 1929 the idea of "Red-Reading-Mercury" was born. This so revolutionized the thermometer industry that today all thermometer manufacturers in the U. S. have made thermometers from this patented tubing. It was the most radical improvement ever made in thermometers and was originated by Palmer.

Because of the fact that mercury is a natural mirror, a strip of Red glass can be drawn into the thermometer tube and as the mercury rises in the tube, it catches and reflects this Red color. The mercury is not harmed. Only a bright Red column is seen and this became a boon to thermometer users, where thermometers are installed in dark places, near smoke, steam, etc. The Red column is easy to see anywhere. "Red-Reading-Mercury" is a basic idea, patented in U. S., Canada, England, Germany, France and other foreign countries. "Red-Reading-Mercury" thermometers are made, under Palmer licenses, in all these countries, who in turn supply the world. Thermometers with this tubing have been furnished to U. S. Bureau of Standards and many Government departments. It has been considered such an aid to proper reading of temperatures that "Red-Reading-Mercury" is included in Government specifications.

Many new and different types of thermometers have been designed by Palmer. Among these are: Pocket style Oven-test thermometer, dough-mixer thermometer, uniform single-bore tube for Pasteurizer thermometer, a strong and sturdy copper-case for confectioner's thermometers, etc. Our own engineers have built special equipment for making very accurate and thoroughly annealed thermometers that can be found in no other thermometer factory.

The first Palmer thermometer was made in 1872. A background of 64 years of knowledge, experience, confidence and fair dealings is an assurance to every user of Palmer thermometers that these instruments will prove satisfactory in every detail.

Left, engraving metal scale on industrial thermometer. Center, making thermometer tubes. Right, machining parts on turret lathe.



DURIRON

The Answer to the Corrosion Problem in the Chemical and Process Industries

TWENTY-TWO years ago, at the beginning of the World War, the first commercial scale production of Duriron for the handling of corrosive solutions was begun. The Duriron Company was organized in May 1912, and the first two years of the company's activities were spent mainly in development work. With the advent of war in Europe, the demand for high explosives increased tremendously, and simultaneously a corresponding need arose for a material that would successfully withstand the attacks of nitric, sulfuric and other acids used in supplying the needs of our Government and industries during that critical time.

Duriron met these needs because of its acid resistant properties and because it could be rapidly produced in sizes and shapes of equipment required.

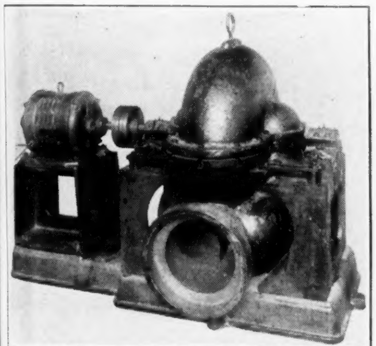
When German dye supplies were cut off, Duriron filled the breach by providing equipment for the embryonic dyestuffs industry. The rapid development of our chemical industry was greatly aided by the availability of Duriron. The Federal Government, when the United States entered the War, took over control of the production and shipping of this essential material to points where it was most needed.

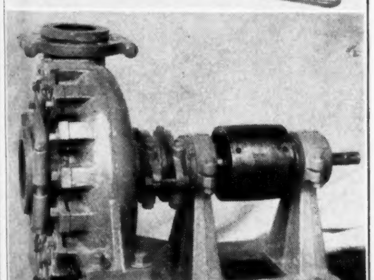
With the cessation of hostilities, there was no longer a demand for the type of equipment produced for war purposes. Duriron had proved its worth for handling corrosives, but a new type of equipment had to be developed for peace-time needs.

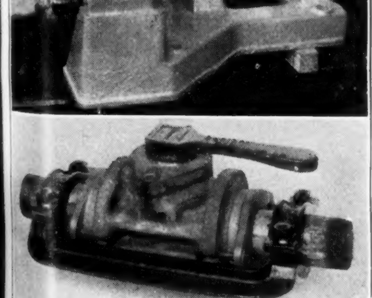
Since then, all departments of the company have worked continuously to develop new alloys and better products so that the needs of industry in handling corrosives might be met more efficiently. The search for the answer to many corrosion problems has enabled us to accumulate a valuable fund of knowledge. This, in turn, has resulted in the development of equipment and alloys to meet specific needs. The first alloy developed, following Duriron, was "Alcumite," an acid resisting aluminum bronze, machinable and of high strength especially adapted to use with sulfuric acid under non-oxidizing conditions and to a large number of other acids. Then followed "Durimet," a high chromium, high nickel alloy steel, highly resistant to sulfuric acid under oxidizing conditions, and to many other corrosive solutions such as hot sulfite liquors. Durco Alloy Steels, of the "18/8" series, with or without molybdenum, naturally came into the fold. Durimet and the Durco corrosion-resisting alloy steels are produced in high frequency electric induction furnaces, one object in using these furnaces being to keep the total carbon below 0.07 per cent. to avoid inter-crystalline corrosion. "Durichlor," an alloy similar to Duriron in physical characteristics, was the result of a demand for an alloy which would withstand hydrochloric acid in all concentrations and at all temperatures up to the boiling point.

As the demands of the chemical industry for engineered products became more exacting, improvements in design of standard stock items, such as pumps, valves, etc., have kept pace with these requirements. Close cooperation between our own engineering department and that of our customers has resulted in equipment that made possible the commercial scale production of processes that might not have passed the laboratory stage.

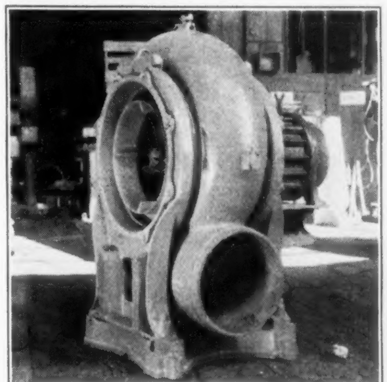
Top to bottom: An early type Duriron Fan: One of the earliest type Duriron pumps: One of the early Duriron Valves: An early type of Duriron Heating coil.

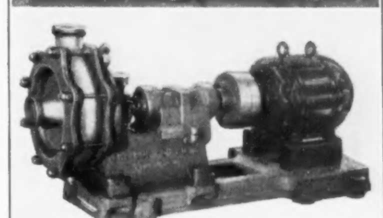


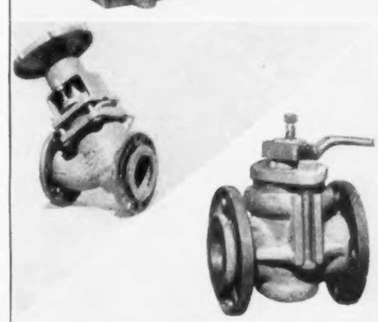


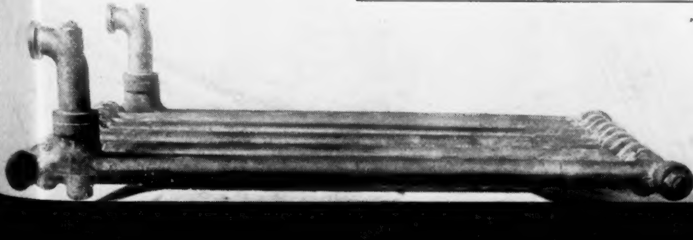


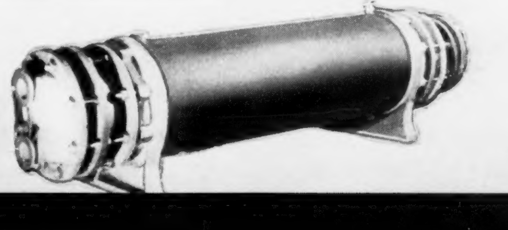
Top to bottom: Current type Duriron Fan, made in five sizes: One of the newer type Duriron pumps with capacities to 1700 gpm. Latest Duriron Y Valve and Duriron-Nordstrom lubricated cock: Duriron Heat Exchanger for liquids or gases.











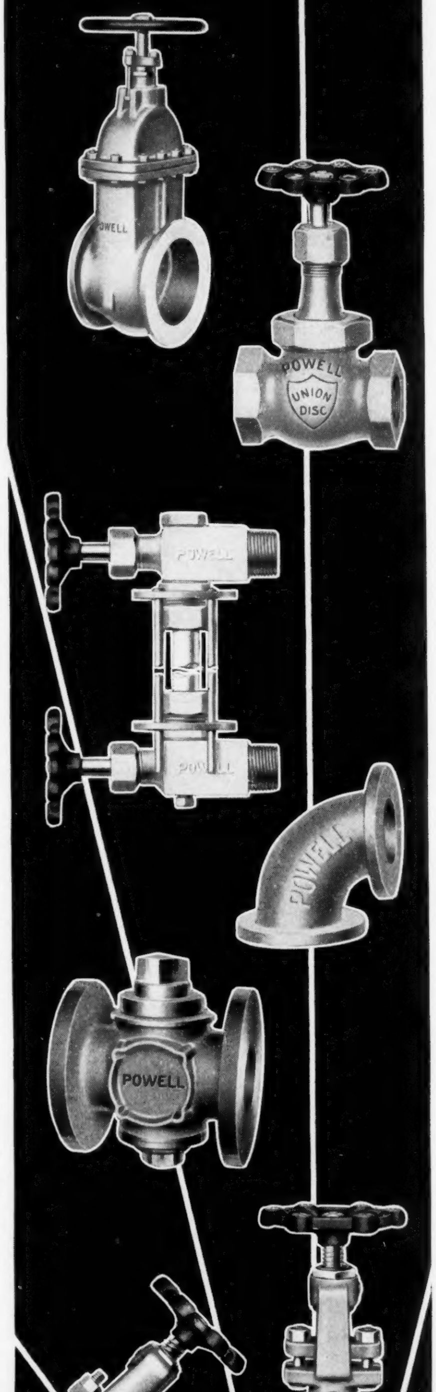
Corrosion Resistant Valves

THE control of diversified products made synthetically or through new processes evolved during the last decade gave origin and significance to a new enterprise. To handle the special and corrosive media encountered in these new process industries, The Wm. Powell Co. developed the Special Alloy Valve Division for the manufacture of corrosion resistant valves and fittings. This endeavor is significant not only from a corrosion resistant standpoint of the wearing life of the control equipment, but from the fact that the corrosion may affect the material used in the special process.

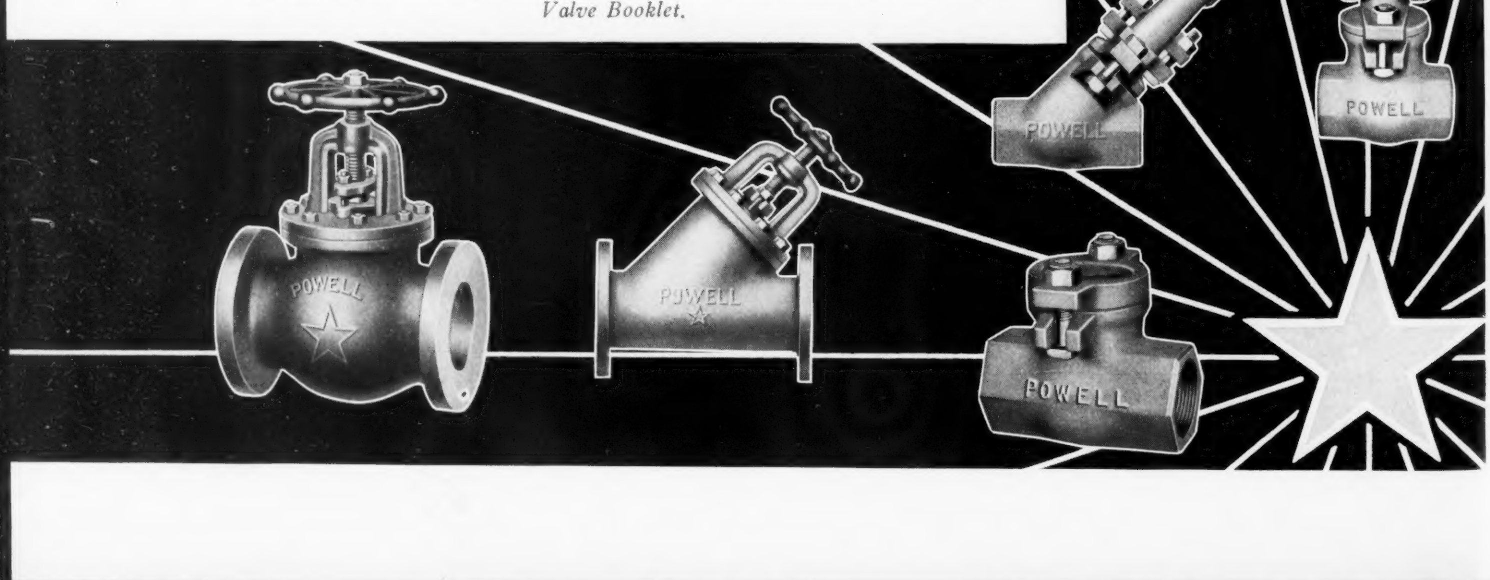
Accordingly, The Wm. Powell Co. was a pioneer in the special alloy valve field. The first efforts in this direction go back 20 years or more to the time when such "special" alloys as monel metal and nickel-bronzes were supplied for numerous acid and alkali media, and aluminum gate and globe valves were used in the manufacture of ammonia from coal tars. As new and improved processes evolved from pilot plant into commercial undertakings, these diversifications required more special and corrosion resistant materials.

The corrosion resistance of such materials when subjected to actual service conditions was first proved by the Special Alloy Valve Division through laboratory tests. The staff of Powell engineers, chemists, and metallurgists welcome consultations based on practical experience and their work in the Powell laboratories, which are equipped with modern scientific test equipment for rapidly determining the corrosion resistance and wearing life of these products.

With a greater number of special alloys having casting characteristics different from those of bronze, iron, and steel came the necessity of improved foundry technique in the making of solid, homogeneous, pressure-tight castings of intricate valve shapes. This stimulated the development of new compact, light designs incorporating greater safety factors—to avoid the use of unnecessary cumbersome and heavy patterns.



A few of the corrosion resistant valves described in the Powell Special Alloy Valve Booklet.



for the Chemical Industries

Today Powell has available a complete line of valves ranging in size from $\frac{1}{8}$ inch to 30 inches. Gate, globe, angle, check, needle, and Y valves—also cocks, liquid level gauges, fittings, etc.—are made from copper, nickel, silver, nickel-silver, aluminum, aluminum alloys, aluminum bronzes, acid-resisting bronzes, nickel-bronzes, silicon bronzes, brasses, straight high chrome-irons, chrome-nickel-iron, chrome-nickel-molybdenum, and nickel-chromium-copper alloys.

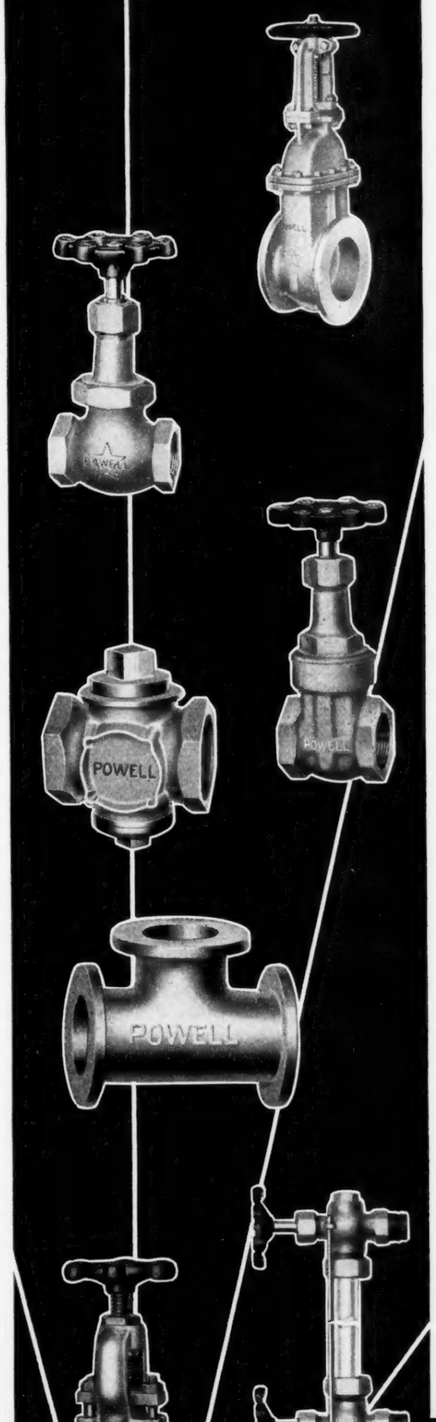
The majority of the alloys are the commercial type from which castings and rolled bar stock are obtainable for making valves. The selection of suitable materials for the construction and fabrication of plant equipment requires the most careful survey as to the properties of the proposed materials to be used and the actual operating conditions.

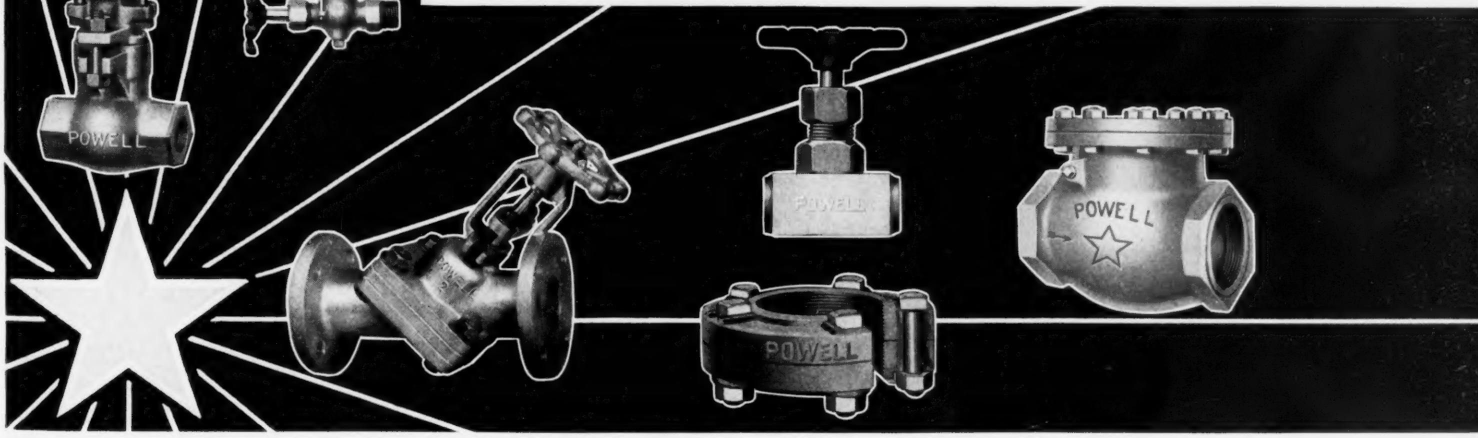
In the search for suitable materials it must be considered that slight variations in concentration, temperature, or pressure, presence of small quantities of impurities in the media or in the materials themselves may accelerate corrosion. The final criterion for the selection of materials, therefore, is—does it prove satisfactory under operating conditions.

Diversity of application, for instance, in the chemical, pulp and paper, textile, dye, rayon, canning, and explosive industries precludes the use of any one alloy but necessitates special alloys adapted to each particular service. Present-day industry requires valves and fittings made especially for its needs.

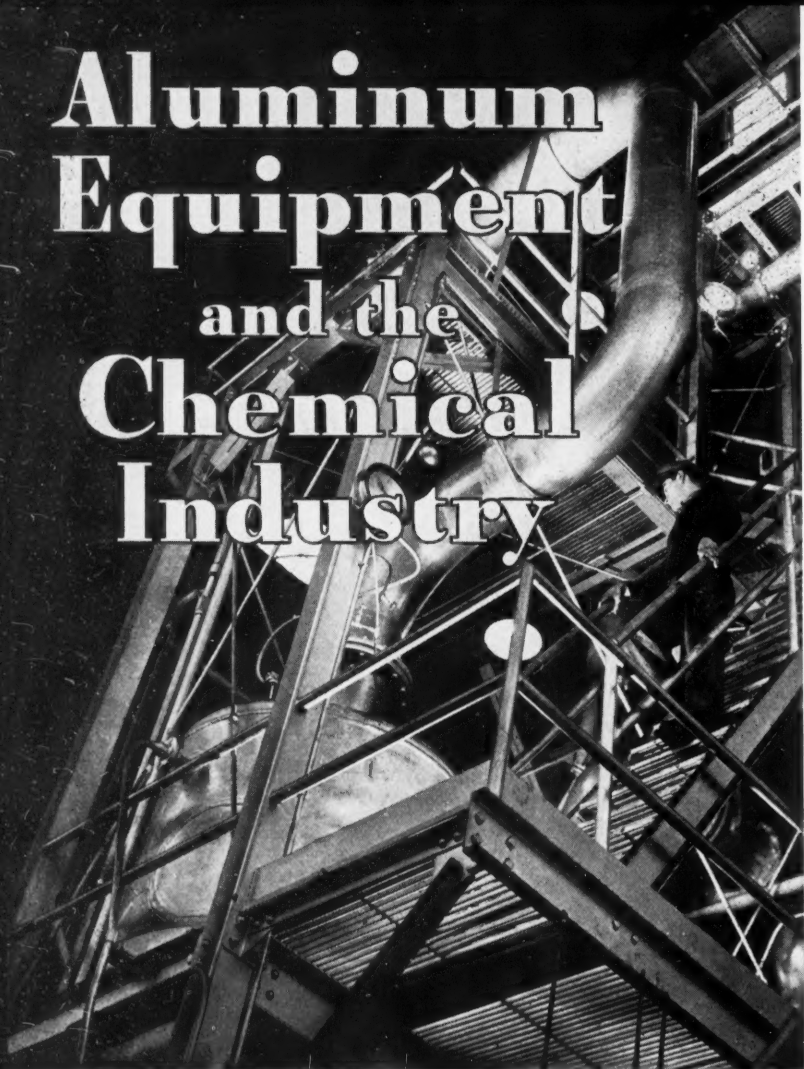
The desire to be of service—to keep pace with diversified processes, to cooperate in the solution of control problems—prompts the invitation to consult with the Powell Special Alloy Valve Division. An ever-increasing number of inquiries, new orders, and repeat orders from present satisfied users conclusively show that these special alloy valves—just like all Powell products are upholding the Powell prestige. The company engineers may be reached at 2525 Spring Grove Avenue, Cincinnati, Ohio.

Powell valves range in size from $\frac{1}{8}$ inch to 30 inches.





Aluminum Equipment and the Chemical Industry



ALUMINUM, structurally strong and resistant to chemical corrosion, is making important contributions to progress in the chemical industry. Another property of importance is the high thermal conductivity of the metal, which simplifies the problem of heat transfer in chemical equipment. Still another advantage in the use of aluminum, for certain types of equipment, is the fact that the salts of aluminum are colorless; traces of the metal introduced into the product do not discolor and are generally harmless. Aluminum is not an oxygen carrier, as are some other metals, and it does not catalyze or promote undesirable reactions. These and other properties, taken together, make aluminum a structural material of first importance to the chemical industry.

Among the industries using aluminum equipment are those producing cellulose acetate, acetic acid, naval stores, stearic acid, oleic acid and viscose rayon. Aluminum is employed for stills, condensers, evaporating pans, tanks, kettles, shipping containers, coolers, centrifugal extractors, pipe and fittings, to mention only a few items.

Eliminating the possibility of color contamination is of utmost importance in the production of cellulose acetate used for such purposes as photographic films and transparent packaging materials. In the processing of cellulose acetate, aluminum has proved desirable for tanks in which glacial acetic acid and acetic anhydride are stored, because they have little effect on aluminum, and tanks of this metal are usually less expensive than tanks of other metals. Aluminum, and sometimes other metals, are used for the construction of acetylators. None of the metals is entirely resistant to attack, but aluminum is preferred because it introduces no colored corrosion products, and in addition, it possesses high thermal conductivity and is readily formed and fabricated. Likewise, aluminum is desirable for mixing and measuring vats, precipitators and piping. In the construction of baskets for centrifugal extractors, aluminum is advantageous, not only because of its strength and resistance to corrosion, but also because its light weight provides more rapid acceleration and deceleration. Large rotary driers used in the final drying of cellulose acetate are built of aluminum to avoid color contamination.

Aluminum is resistant to many organic acids and organic liquids and is particularly well suited to the production of water-white acetic acid, where it is used in the final processing of refined, concentrated acetic acid. Condensers, vacuum receivers, storage tanks and piping of aluminum have proved advantageous especially when the equipment is used intermittently. This type of service accelerates the attack on some metals but retards the attack on aluminum by permitting the periodic formation of a protective coating of aluminum oxide.

The oxide coating, which is a natural formation always found on the surface of aluminum (except when amalgamated), offers considerable protection to the

Stearic acid solidifying trays made of aluminum. The illustration at the top of the page shows a receiver and gooseneck of aluminum construction used in the stearic acid industry.

underlying metal at all times. It is chemically inert and insoluble in many reagents. The natural oxide coating is extremely thin, but by suitable electrochemical processes an oxide coating can be formed of greater thickness and superior resistance; it affords excellent protection not only against corrosion but also against abrasion. By subsequent treatment it is possible to impregnate the coating with a corrosion inhibitor or to increase its impermeability by a sealing treatment. These various methods of producing and treating oxide coatings are comprised in the Alumilite* process.

In the acetic acid industry, the use of aluminum for shipping containers is well established. Shipping drums and tank cars are both used. Aluminum has been found useful in shipping nitric acid. Concentrated nitric acid made from atmospheric nitrogen has practically no effect on aluminum, and drums made of this metal are now used successfully for handling concentrations as low as 50 per cent. Aluminum drums and equipment may also be employed for processing and handling very dilute solutions. Similar drums and tank cars are used for the transportation of hydrogen peroxide. Aluminum is the only common metal which does not appreciably catalyze the decomposition of hydrogen peroxide.

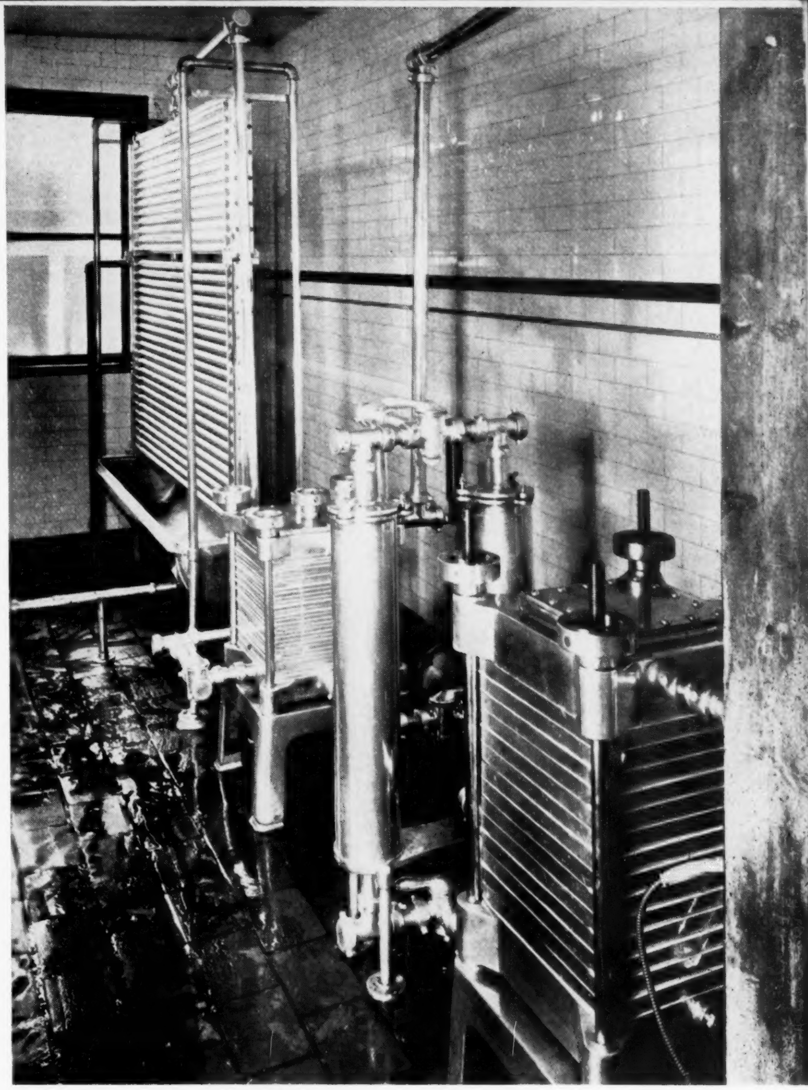
In the production and shipment of formaldehyde, advantage is taken of the fact that aluminum causes no catalytic oxidation effects. Some of the other metals cause considerable loss of formaldehyde through decomposition. Receiving and storage tanks of aluminum construction are in use and the initial cost of this equipment is generally lower than that of equipment made of other metals.

Aluminum is a desirable construction material for a number of reasons other than its chemical properties. In the first place, it is available in practically all the forms known to the metal-working art: plate, sheet and foil, bar, rod and wire, rolled structural shapes, extruded shapes, tubing and molding, rivets and screw-machine products, impact extruded products, forgings, and sand, permanent mold and die castings. Because aluminum is available in such a variety of forms, the design and fabrication of equipment are simplified and less costly. Aluminum sheet and plate are produced in larger sizes than are common in other metals. The use of large sheet in tank construction, for example, reduces the number of joints and also the time required for fabrication. The light weight of aluminum is an advantage in handling and installing equipment. Aluminum is readily formed and welded and therefore is adaptable to all types of tank construction, coils and jacketed kettles.

The works of the Aluminum Company of America are completely equipped for the fabrication of chemical equipment. Shop fabrication is generally less expensive because of the availability of suitable equipment for forming and joining, and advantage can be taken of the experience and resources of the shop personnel. Tanks up to 12 ft. by 20 ft. can be fabricated and shipped in one piece; larger tanks are field-erected.

Much of the existing aluminum chemical equipment

* *Patented.*



Milk pasteurizing equipment including aluminum plate heaters, filters, cooler and piping.

Light-weight, sanitary milk can of welded aluminum construction.

has been built of commercially pure aluminum, designated as 2S. In some cases, higher-purity aluminum has been used because its resistance to corrosion by acids is generally better. When higher strengths are required, an alloy containing approximately 1.25 per cent. manganese is often used. This alloy is known as 3S. The strength of both of these materials and also that of high-purity aluminum may be increased by cold rolling.

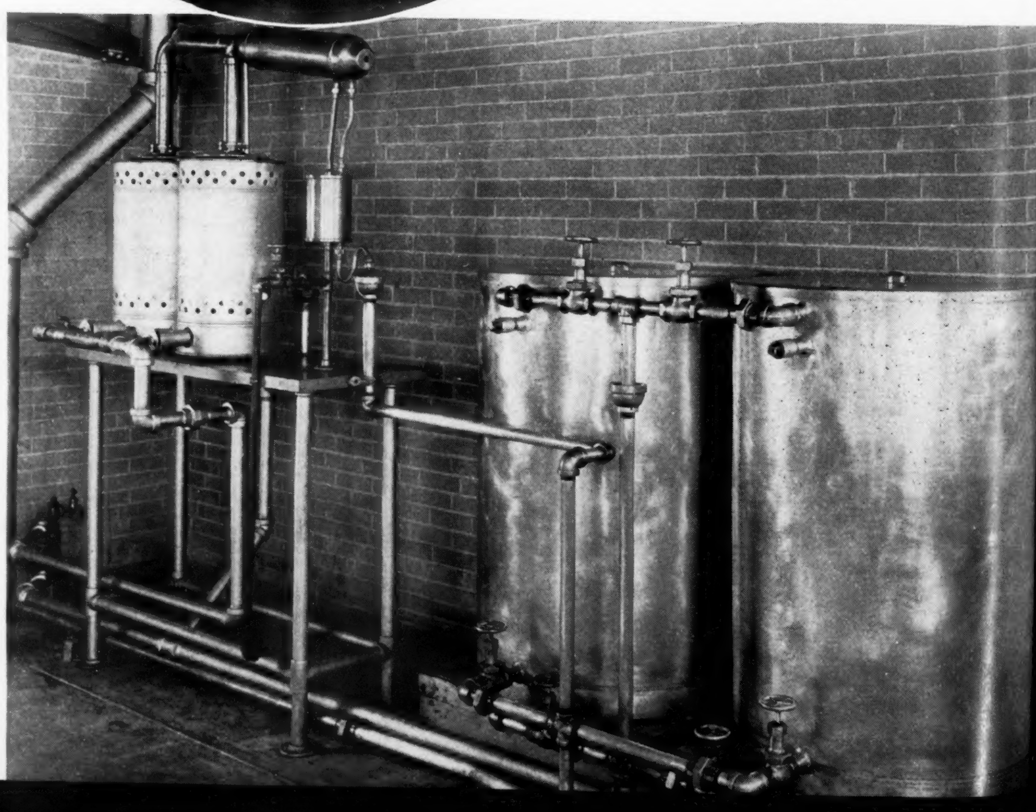
Recently, two more alloys unusually well suited for chemical equipment have become available. One of the alloys, 52S, containing a small amount of magnesium, is superior to commercially pure aluminum in resistance to salt solutions, and when used in conjunction with the casting alloy, 214, of related composition, will probably give the best results obtainable with aluminum. The other alloy, 53S, containing magnesium and silicon, also possesses unusual resistance to corrosion and is the stronger of the two alloys. Both possess considerably more strength than 2S, 3S and high-purity aluminum.

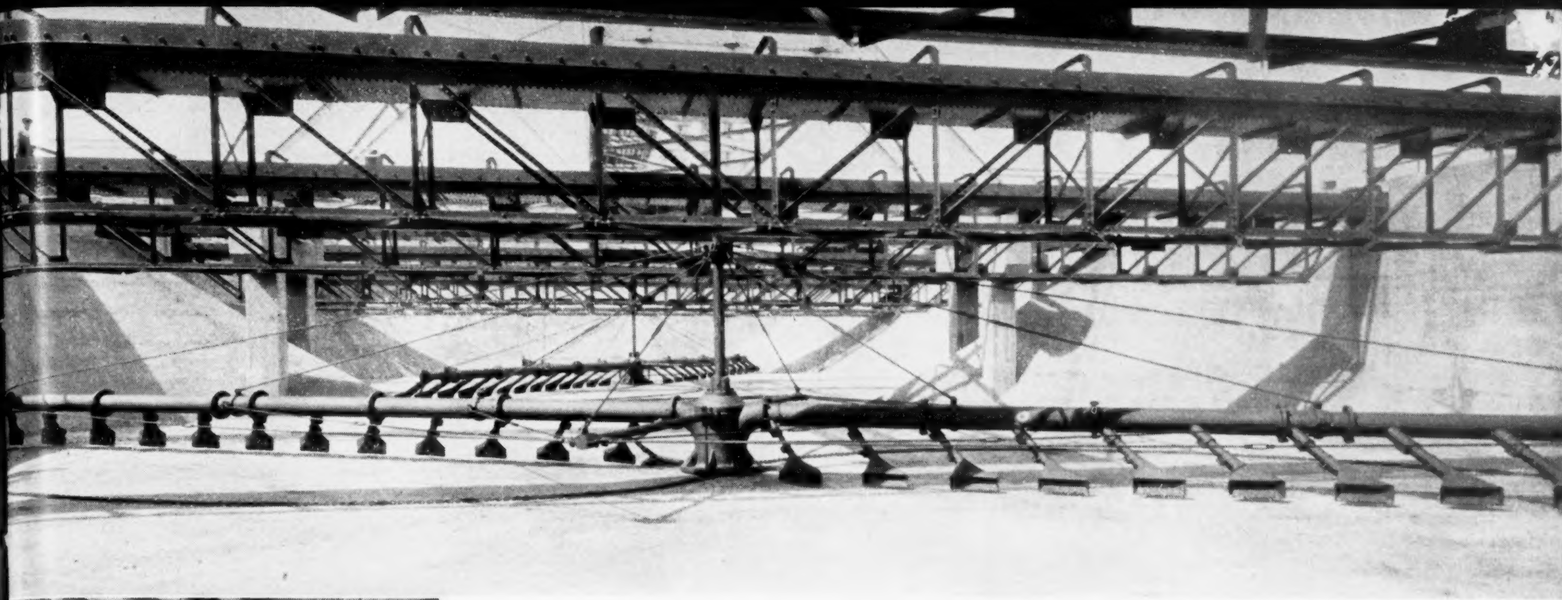
Alloy 52S retains a higher strength at elevated temperatures, and for this reason, is replacing 3S for varnish kettles. The acids in the gums and resins and vegetable oils used in the manufacture of varnishes do not attack aluminum even at the temperatures employed in the process. The problem of designing the kettles for proper strength at the operating temperatures is simplified by the newer alloy. Inasmuch as varnishes are graded on the

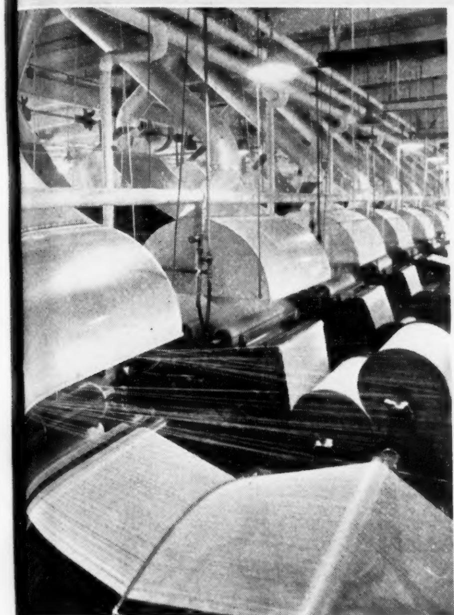
Aluminum tanks for storage of water-white chemical. The tank on the right has a capacity of 150,000 gallons.

Varnish kettle made of aluminum alloy 52S.

Aluminum equipment for storage and distribution of distilled water. Aluminum parts include storage tanks, pipe, fittings and valves.



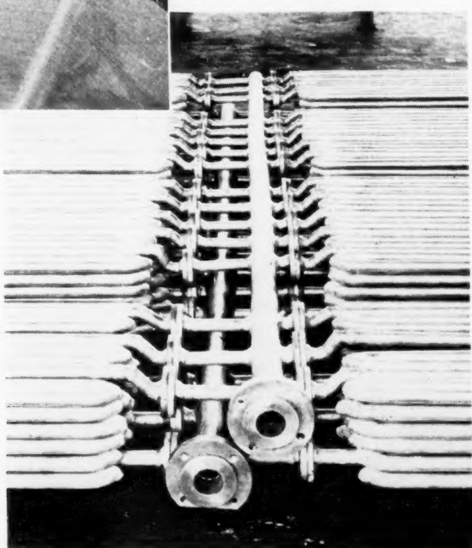




Tow-Bro sludge remover at Milwaukee Sewage Plant. Aluminum collector nozzles, header and stay rods are used.

Aluminum slasher hoods used in cotton mill under conditions of high temperature and humidity.

Turpentine retort heating coils illustrating welding and forming of aluminum piping.



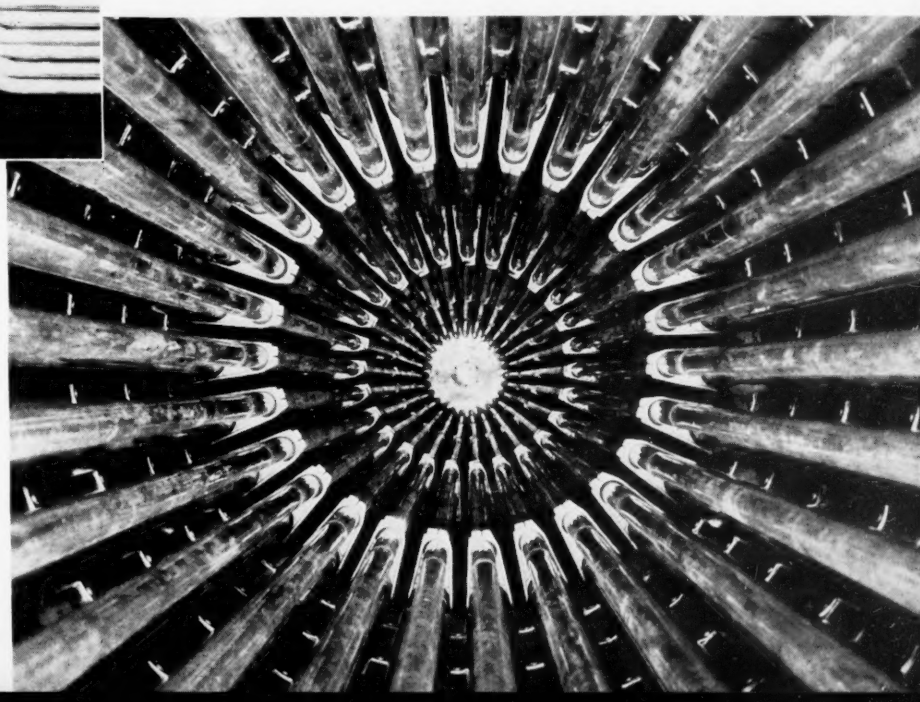
which they are produced, and the resulting product commands a higher price. In the newer processes in which turpentine and pine oil are produced from stump wood, aluminum equipment is also useful. Since it is not attacked by these products even in the crude form, the metal has been found suitable for storage tanks, and for stills and condensers used in redistilling crude turpentine and pine oil.

In the production of stearic acid and oleic acid, aluminum equipment is necessary if a product of highest purity and best color is desired. Aluminum may be used to advantage in all operations subsequent to distillation. The equipment includes condensers for fatty acid vapors, storage tanks and solidifying trays. Correctly designed aluminum trays are an advantage because of the fact that stearic acid cakes do not adhere to them.

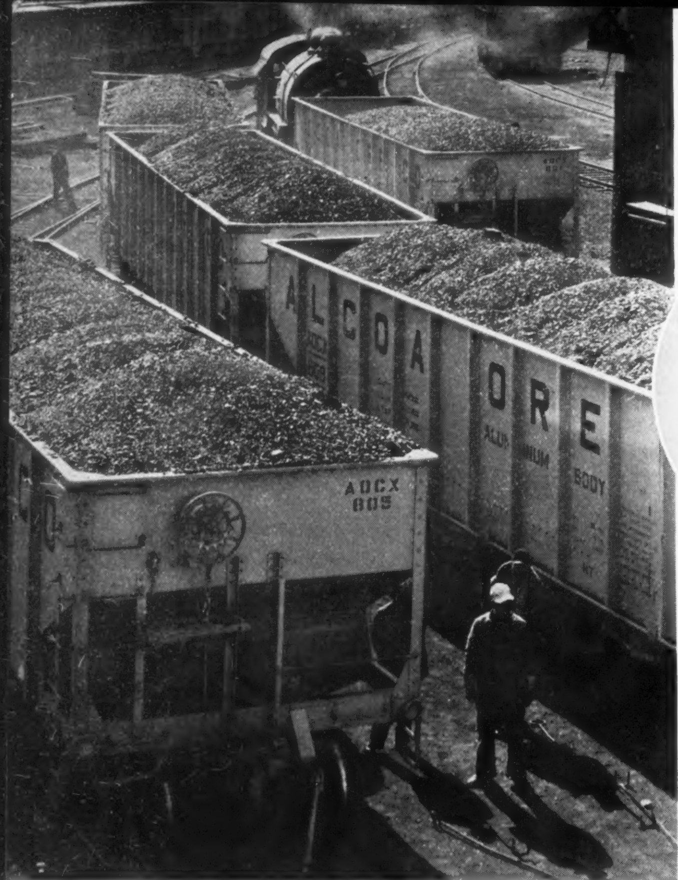
Many of the problems encountered in the production of viscose rayon have been solved by aluminum. Starting with the spinning operation, conditions are such that aluminum equipment may be extensively used. As the thread filaments leave the coagulating bath, they may be collected on aluminum spinning spools or in aluminum spinning buckets, and although the sulfuric acid of the bath slowly attacks the aluminum, there is no danger of color contamination in the yarn, and the life is sufficient for economical operation. Other parts

basis of color, the advantage of aluminum kettles is obvious.

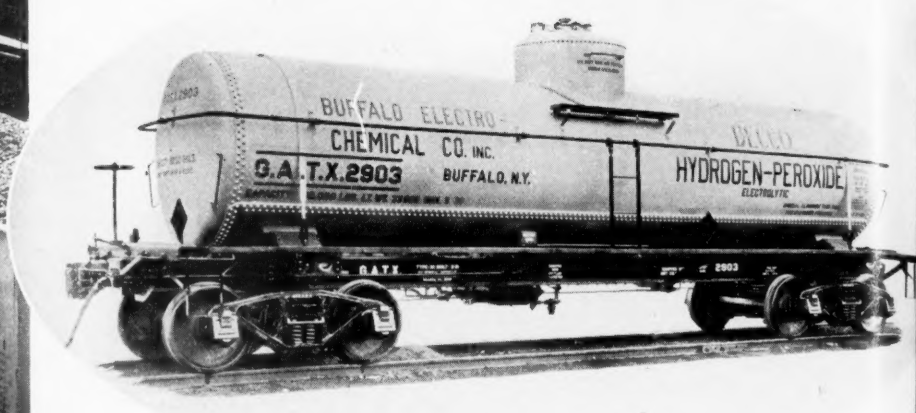
For many years, aluminum equipment has helped in the problem of producing turpentine and rosin free from color contamination. Thousands of aluminum cups are used in collecting the liquors from



Telescopic view of pigment drier used in paint industry. The tubes and cylinder lining are aluminum.



Seventy-ton hopper cars with aluminum bodies used for the transportation of sulfur, soft coal and bauxite.



Aluminum tank car for bulk shipment of hydrogen peroxide.

of the spinning machine are also made of aluminum when located so that products of corrosion collect on the yarn. Hydrogen sulfide, a product of the spinning reaction, is removed in aluminum hoods and ducts.

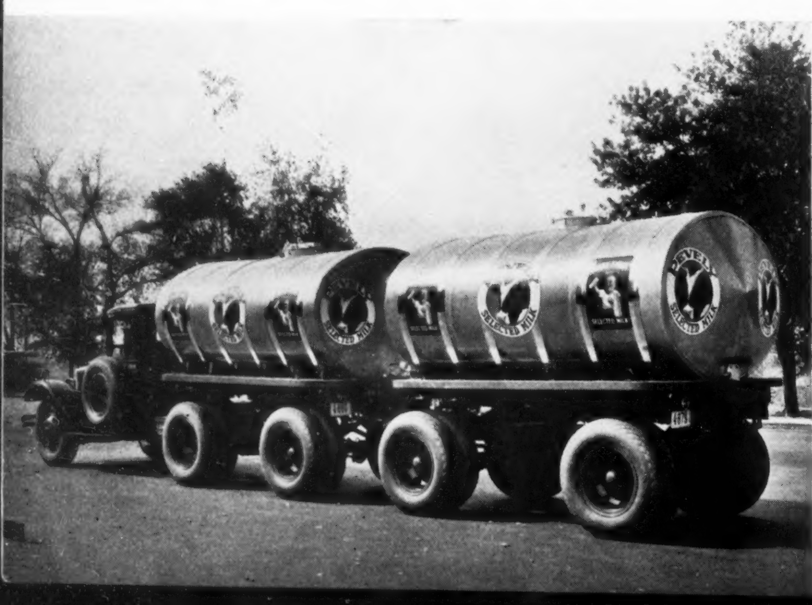
It has been found that the life of spinning buckets can be increased if they are given a special protective coating. Considerable research effort was expended in devising a suitable coating to enable the industry to utilize the inherent advantages of aluminum buckets, namely, light weight and strength sufficient to withstand high centrifugal forces.

After spinning, the yarn package is washed in water. Aluminum piping and fittings are preferred for this operation in order to eliminate the introduction of undesirable metallic compounds which later result in irregular dyeing. Sulfur is removed from the yarn in a manner similar to washing, and most of the plants employing ammonium sulfide for this purpose use aluminum for its storage and distribution and for the desulfurizing machines.

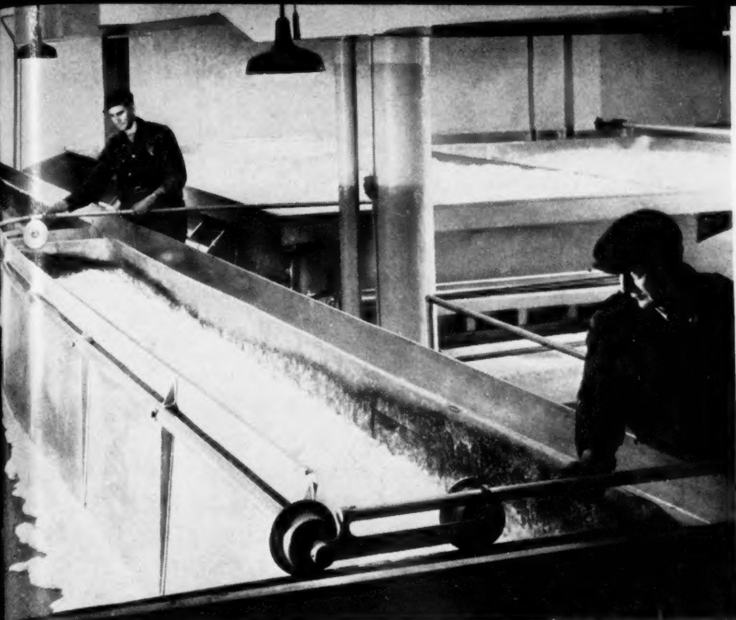
The maintenance of proper atmospheric conditions for the textile processing of rayon is another field served by aluminum. It is used for heating elements and other parts of the air conditioning apparatus because it is resistant to hydrogen sulfide and cannot introduce particles of metallic sulfides into the air. Other applications, some experimental, include separator blades, reels, reel frames, thread guides, tension rods and skein arms.

The use of aluminum in the preparation of foods and beverages dates back to the early history of the metal. The first application in this field was the aluminum table ware of Napoleon III which at that time was more valuable than gold. Later, following the discovery in 1886 by Charles Martin Hall of a process for economically producing aluminum, the manufacture of aluminum cooking utensils was undertaken primarily as a means of using up the surplus stock which the infant industry was accumulating. This outlet for aluminum proved highly successful and out of it has grown the

Aluminum milk tanks for trailer and semi-trailer. The light weight of the tanks enables each unit to carry 100 gallons extra with no increase in gross weight.



Gasoline tank truck with 1500-gallon aluminum tank.



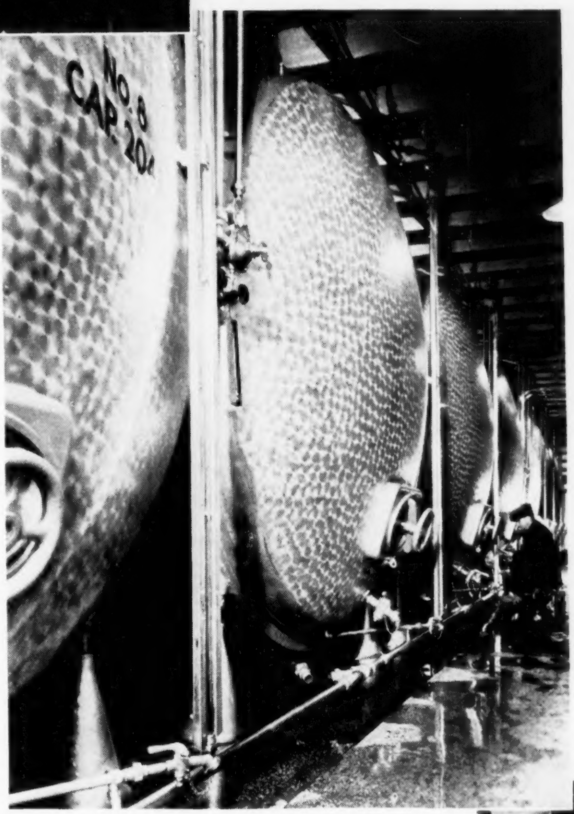
Skimming yeast foam from an ale fermenting tank. The skimmer and tanks are of aluminum construction.

extensive use of aluminum in food and meat packing plants, dairies and breweries.

Among the characteristics for which these industries so heartily accept aluminum are high thermal conductivity, resistance to corrosion, ease of cleaning, and non-toxicity of the metal and its compounds. Not only is aluminum non-toxic to man and animals but also to yeasts and molds used in the fermentation industry. The latter is of vital importance in the manufacture of beer and is partially responsible for the extensive use of aluminum by this industry. Of equal importance to breweries is the fact that pure aluminum and certain of its alloys do not affect the clarity, taste or color of beer. It has been found that aluminum alloys containing much iron, copper or manganese will affect beer, but others like 53S (containing magnesium and silicon) may be used safely.

In Europe and other parts of the world not affected by Prohibition, the use of aluminum brewery equipment is well established. Some 700 storage and pressure tanks are in operation in Norway alone. In the United States, the use of aluminum was just getting under way when the Eighteenth Amendment was enacted. During the Prohibition period, practically no advancement was made, but in the last few years, a number of breweries have installed modern aluminum equipment and several are sufficiently outstanding to be classed among the well aluminized breweries of the world.

The equipment of one of these plants, the Victor Brewing Company, includes two 430-bbl. settling tanks, six 468-bbl. ale fermenters, seventeen 300-bbl. storage tanks and eight 204-bbl. Government tanks. The ale fermenters, and, for that matter, most aluminum tanks, are of welded construction. Attemperator coils for the circulation of brine are made of aluminum. The corrosive action of brine on aluminum may be inhibited by the addition of a small amount of potassium dichromate to the brine. Corrosion inhibitors are also useful when it is desired to employ aluminum in contact with alkaline materials. This point is illustrated by the use of sodium silicate in certain soaps and creams packaged in collapsible aluminum tubes, also in alkaline cleansers for cleaning aluminum equipment.



Aluminum tanks for the storage of beer and ale.

The mechanical skimmer for the ale fermenters is of aluminum construction and may be moved from tank to tank. Equipped with flanged wheels which roll along the top edge of the tank, the skimmer draws the yeast to one side and out through two ports where chutes carry it to the yeast tubs. The tubs and other yeast handling equipment, such as ladles, scrapers and dollies, are made of aluminum.

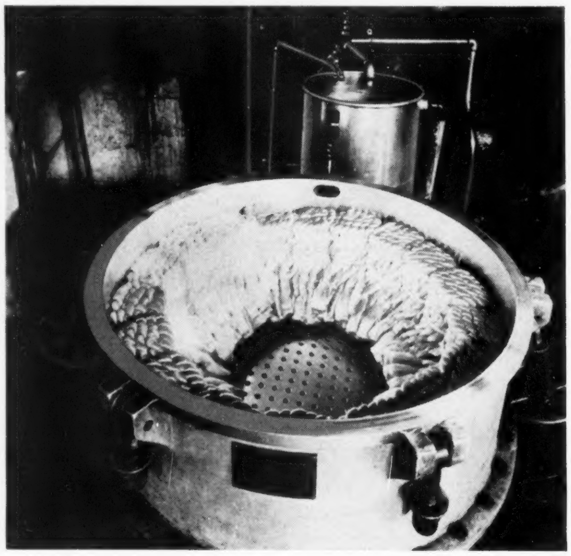
The eight 204-bbl. Government tanks present a most attractive appearance. They are horizontal tanks, and the heads, all in line, have been given a swirl finish. The scintillating effect of the gleaming swirls produced by

Welding the end bung into a partially fabricated aluminum beer barrel.

this finish adds a sparkle and pleasantness to the room which otherwise might seem cramped and uninteresting.

Although the Victor Brewing Company plant is more completely aluminized than other breweries in this country, the Hoffman Beverage Company's plant of 225,000-bbl. capacity is equipped with a larger number of aluminum tanks, 39 in all. Other brewery installations include such items as brew kettles, wort coolers, filter presses and tank fittings and valves. All are easily cleaned, generally less expensive than other types, and light and conveniently installed and handled.

The aluminum beer barrel incorporates a number of unusual features. In the first place, it requires no pitching or painting or other maintenance. It is easily sterilized and its one-piece welded construction offers no harbor for moisture. Made of 53S alloy and equipped with strong forged bungs, the barrels are exceedingly durable and withstand a pressure of 500 lb. per sq. in. Fewer men and trucks are required to handle aluminum beer barrels because they weigh only one-fourth to one-third as much as other types.



Soaking machine made of aluminum alloy for removing gums and resins from silk.

Beer barrels, and aluminum equipment in general, make a pleasing appearance. This is appreciated particularly by the food and beverage industries and may be classed as a real advantage where cleanliness and attractiveness are essential. This factor, plus non-toxicity, resistance to corrosion, and light weight, has enabled aluminum to contribute much to the dairy industry.

A large number of dairies all over the country are using aluminum for various purposes—pasteurizing equipment, storage tanks, milk cans and tank trucks. Aluminum pasteurizing equipment includes regenerative and brine coolers, filters and plate heaters. Plates for the heaters are either castings or forgings and the light weight of aluminum makes disassembling for cleaning an easy matter. The thermal conductivity of aluminum is an asset to plate heaters and also to coolers.

The aluminum tank truck has contributed much to the economical bulk transportation of milk. The use of the lightweight tanks results in an increase in payload with no increase in gross weight; the tank cost is usually less than that of tanks of heavier materials which are suitable for this type of service. In this application, as in all other dairy applications, the non-toxicity of aluminum and the ease with which it can be kept clean and sterile are of fundamental importance.

The production of distilled water has recently taken on a new aspect as a result of a ruling made by the American Pharmaceutical Association and the United States Pharmacopoeial Convention. In effect, the ruling states that distilled water for pharmaceuticals may contain only 5 parts per million of solids. After the preparation of distilled water meeting this requirement, the use of aluminum storage tanks and piping greatly simplifies the problem of maintaining the purity. The natural oxide coating on aluminum is insoluble in distilled water and therefore prevents the addition of solids to the water. This has been confirmed by careful tests over a long period of time on an actual installation in which aluminum storage tanks, pipe, pipe fittings, and valves were used. Aluminum's strength and stiffness make it a more desirable material for this service than the other materials commonly used.

The inherent resistance of aluminum to attack by sulfur and sulfur-containing materials makes it well suited for use in their production and handling. Neither liquid sulfur nor the vapors combine with aluminum. In the transportation of sulfur, aluminum-bodied hopper cars of 70-ton capacity have given excellent service. Likewise, aluminum-bodied hopper cars and trucks resist the corrosive action of high-sulfur coal much more successfully than bodies of conventional construction. Aluminum is also suitable for rubber molds, inner tube mandrels, and conduit for electrical wiring.

The successful applications described in the foregoing owe no small part of their success to the thorough understanding of the properties and fabrication characteristics of aluminum which the Aluminum Company of America has acquired over a period of many years. Aluminum Research Laboratories is continually investigating the behavior of aluminum under different conditions and developing new alloys to cope with new conditions. Plant operations are under the constant supervision of the plant technical departments in order to maintain the quality of aluminum commodities and to perfect the methods of forming, joining and fabricating aluminum equipment. Potential applications are carefully studied by the Development Division, which also supplies engineering supervision for new applications.

As a result of this study and experience, the Aluminum Company of America has accumulated a vast store of fundamental knowledge and practical fabrication skill. This background has enabled the Aluminum Company of America to contribute liberally to chemical progress through the intelligent utilization of aluminum.

Cutting the Cost of STAINLESS STEEL

In the Chemical Industries

Above, the kettles shown in a large soap factory are lined with IngAclad. All stacks, carrying fumes and vapors from kettles, are also constructed of light gauge IngAclad.

RELATIVELY high cost is the one factor which has limited the United States' production of stainless steel to approximately 70,000 tons in 1935. In an effort to lower the costs for corrosion-resisting equipment, the Ingersoll Steel & Disc Division of Borg-Warner Corporation, Chicago, developed Stainless-Clad Steel, after several years of painstaking development and research, offering it to the trade in 1932.

Stainless-Clad Steel came as a logical extension of Ingersoll's experience in producing special steels since 1884. Among these steels were the two-ply and soft center (three-ply) steels used so extensively for agricultural implements such as plows, coulter discs, etc.

IngAclad Stainless-Clad Steel. Stainless on one side. Mild carbon steel on the other.

IngAclad, produced in sheets and plates from 18 gauge to 1½ inch thick, has one surface, comprising 20 per cent. of the total thickness of the sheet or plate, consisting of the highest type of stainless steel, which is inseparably bonded or welded to the remaining 80 per cent. thickness of ordinary mild steel. The bond between the stainless and the mild steel is secured by the patented "welded-in-the-ingot-method." The resulting two-ply, or Stainless-Clad Steel, sells at a base price approximately one-half that of solid stainless steel.

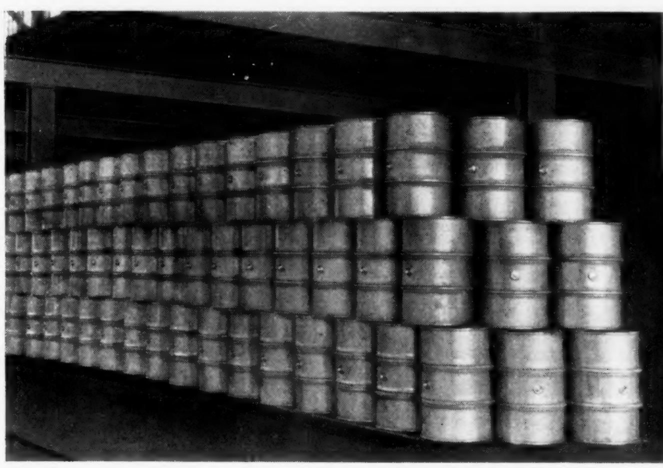
The usual grade of IngAclad has a 20 per cent. stainless layer of Type No. 306, 18 per cent. chrome, 8 per cent. nickel, low carbon (under .08 per cent.) stainless. It is also available having a stainless surface containing 2-4 per cent. molybdenum or columbium added to the 18-8 analysis. Other claddings, such as the straight chrome grades are also available.

Chemical plants have been the most extensive users of IngAclad. The very satisfactory manner in which this clad material may be welded and fabricated is a factor, aside from low cost, that explains its preference for many applications.

In the great majority of chemical applications, the protection from corrosion is required on but one surface of the equipment—that surface in contact with the chemical, whether it be acid or alkali. Such equipment includes tanks, vats, shipping containers, dryers, hoppers, table tops and a wide variety of fabricated equipment such as evaporators, vacuum pans, condensers, absorbers, etc.

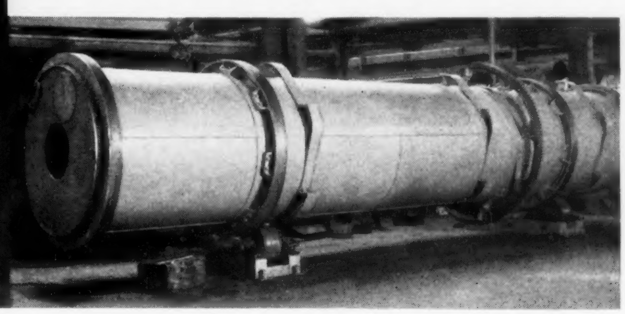
Not only in the United States has IngAclad, through its domestic licenses, reduced the cost of stainless for the chemical industry, but licenses to produce IngAclad also have been granted to the world famed Krupp Works of Essen, Germany, and the United Steel Companies, Ltd., of Great Britain.

A treatise on the welding and fabricating of IngAclad is available upon request to the Ingersoll Steel & Disc Division of Borg-Warner Corporation, 310 South Michigan Avenue, Chicago, Illinois.

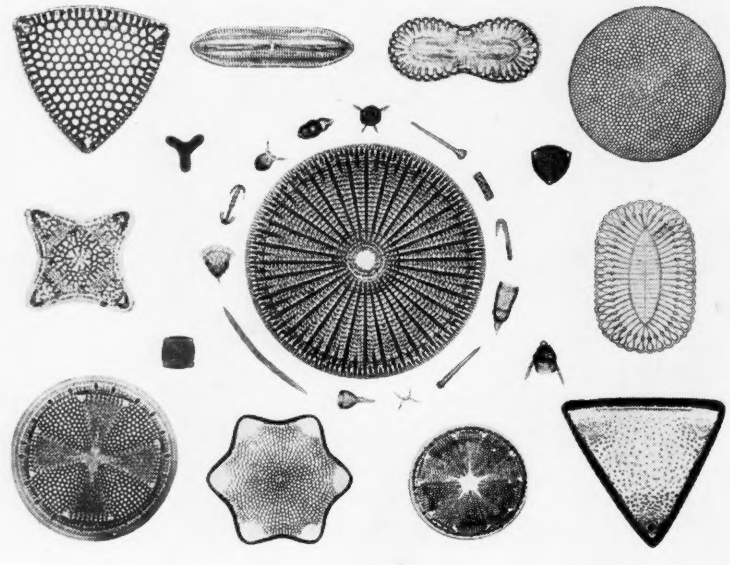


At left, IngAclad Stainless-Clad Drums ready for shipment from the plant of the Stevens Metal Products Co., Niles, Ohio.

At right, large chemical dryers are selected for use in leading chemical processing plant. Economy and corrosion-resistance dictated the use of IngAclad for this all-welded dryer.



Putting the Diatom to Work - - -



Diatoms pose for a picture. Photo-micrographs, at several hundred diameters, of a number of interesting forms of diatoms and sponge spicules found in the Johns-Manville Celite deposits. Note the amazingly complex and beautiful designs.

With these fossilized, microscopic sea plants, Johns-Manville research has revolutionized filtration processes and given the chemical industries a highly versatile group of inert mineral fillers

UP till 1913 the diatom had remained chiefly an interesting subject for the scholar's microscope—a vegetable organism whose commercial possibilities were virtually unknown.

But, in that year, research along these lines was seriously applied for the first time. At the Johns-Manville Celite Laboratory, chemists and engineers working with a practically limitless supply of diatomaceous earth, taken from deposits at Lompoc, Calif. (now owned and operated by Johns-Manville), began their pioneering work. And pioneering it was—for there were no precedents to follow.

Yet, in a few years, this same laboratory brought forth developments that revolutionized clarification methods in many chemical and food products industries; brought improvements and cheaper production to a wide variety of products by the perfection of inert siliceous fillers; opened up an entirely new field of high-temperature insulation.

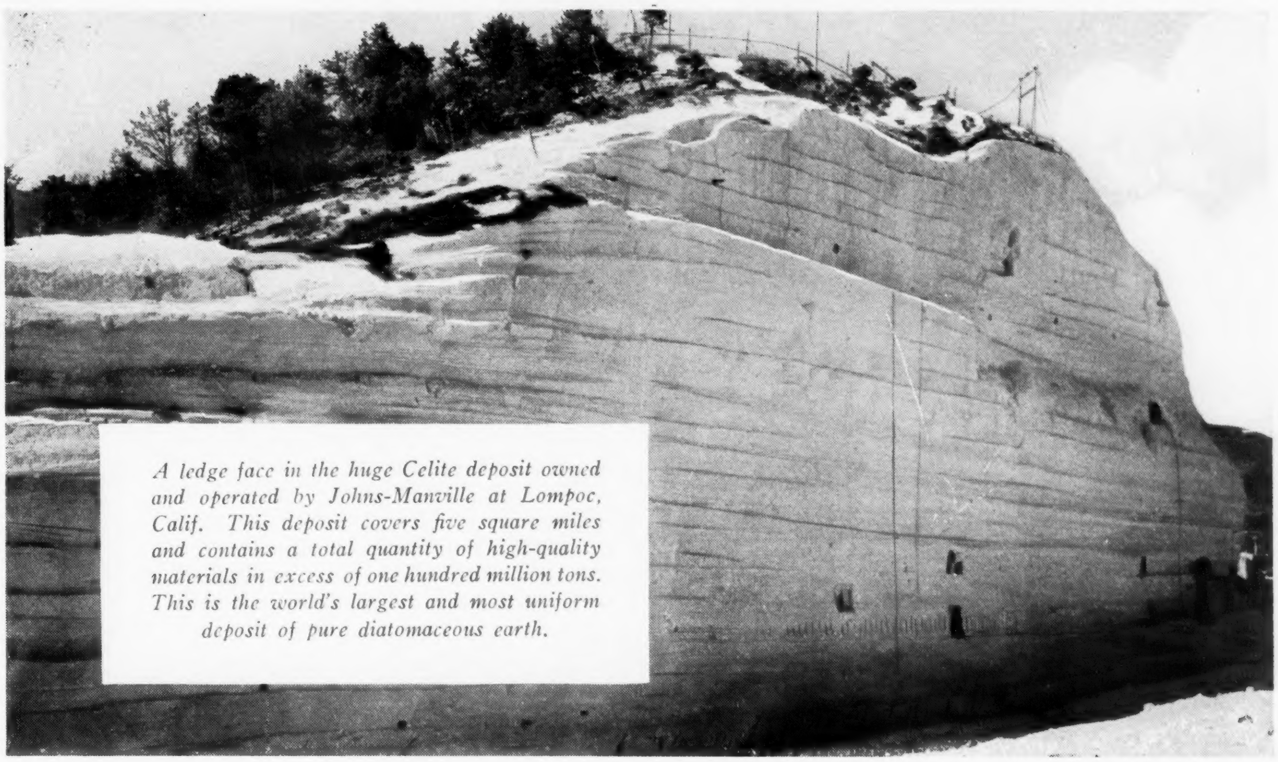
Solving industry's clarification problems. A partial view of the Celite laboratory at Manville, N. J., where problems of industrial filtration are investigated. The research carried on here into the manufacture of filter aids and their commercial applications have saved millions of dollars for industry.

The Diatom's Contribution to Filtration

Celite (the name used by Johns-Manville for all J-M diatomaceous earth products) was found to hold amazing possibilities as a clarifying agent. The physical structure of the diatom, with its endless variety of intricate shapes, gave the material exceedingly high porosity (90 per cent. by volume of minute air cells) and great absorbing qualities (in powdered form, twice its weight of liquid).

And since Celite was known to be chemically inert, in all respects it presented the ideal filtering agent. Proof came as Johns-Manville research on the diatom began to revolutionize filtering processes in the manufacture of sugar, oils, cereal and fruit beverages including wine, beer, cider and unfermented juices. Also, numerous metallurgical dispersions, chemical serums, dry-cleaning fluids, liquid soaps, water, etc.

Early research in this field was done in the production of sugar and resulted in the standardization of J-M Filter-Cel, the world's first high-quality filter aid. Although it meant the scrapping of much costly filtering equipment then in use, the sugar industry quickly recognized the significance of this new development.



A ledge face in the huge Celite deposit owned and operated by Johns-Manville at Lompoc, Calif. This deposit covers five square miles and contains a total quantity of high-quality materials in excess of one hundred million tons. This is the world's largest and most uniform deposit of pure diatomaceous earth.

Further experiment on other industrial filtrations resulted in various new grades of Celite filter powders, developed to give higher rates of flow or other desired qualities. Chief among these are the Super-Cels, including Standard Super-Cel and Hyflo Super-Cel, produced by calcination of selected grades of material both with heat and with heat plus chemical processing.

Today, thanks to Celite Filter Aids, manufacturers are saving hundreds of thousands of dollars annually through increased production capacity and lower labor and material costs. Also, they are improving the quality of their products, some of which could not be clarified before, and thus are increasing their market value.

Celite as a Mineral Filler

And Celite, because of its inert chemical composition, great bulk per unit of weight, enormous surface area, high absorption and other properties, has become an important and economical filler material for a wide number of products.

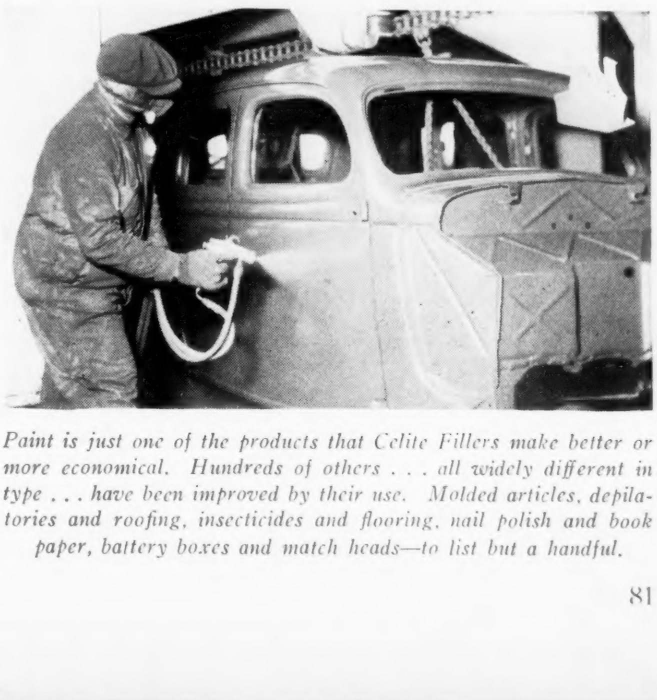
Johns-Manville Celite Mineral Fillers are used as inert extenders and flatting agents in paints, varnishes and lacquers; as fillers in molded plastics; as anti-caking agents for deliquescent crystals; as absorbing agents for liquids; as a support for catalysts; and as fillers in battery-box compositions, flooring and roofing materials, asphalt pavings, bituminous enamels, rubber and paper.

As Insulation and for Miscellaneous Uses

The discovery of Celite's remarkably low thermal conductivity and high heat resistance, led to tremendously important contributions in the high-temperature insulation field. For the first time furnaces, kilns, boiler-settings and other high-temperature industrial equipment could be insulated.

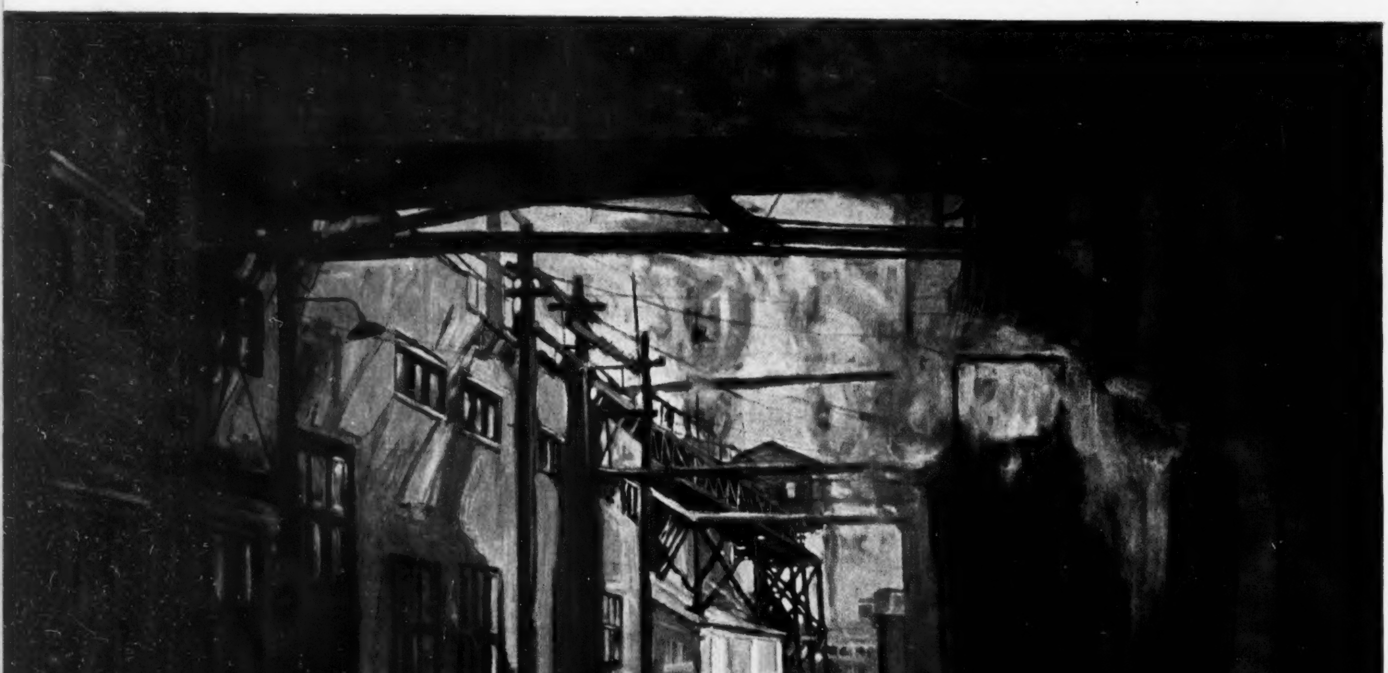
And space permits listing but a few of the thousand miscellaneous uses found for Johns-Manville Celite. Delicately abrasive, it is the principal constituent of many of the finest polishes and cleansers; it is used in carboy packings; in certain artificial silicates, particularly ultramarine blue; and in soaps, cosmetics, waxes, printing inks, etc.

Johns-Manville research, by putting the diatom to work, has in the short space of 25 years effected savings for industry that have been modestly estimated at hundreds of millions of dollars. And other than the limitations imposed by man's imagination, this amazing, invisible plant fossil has yet to show a definite end to its possibilities.



Paint is just one of the products that Celite Fillers make better or more economical. Hundreds of others . . . all widely different in type . . . have been improved by their use. Molded articles, depilatories and roofing, insecticides and flooring, nail polish and book paper, battery boxes and match heads—to list but a handful.

Index of Companies



Paintings by
A. H. K. HAMMO
Courtesy of
DOW CHEMICAL

lings by
HAMMO

rtesy of
EMICAL